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ABSTRACT

This report examines the pattern of student achievement over the summer and the effects and cost effectiveness of summer school. The results of the reported research are directed toward the following policy issues: (1) the relationships between the cost (resources) of summer programs and growth in student achievement; (2) the differences in cost effectiveness as a function of alternative combinations of resources; and (3) a comparison of the relative cost effectiveness of summer and school-year programs. It is reported that the cost of instructional resources used in summer reading and math programs are usually higher for students with lower pretest scores. The overall results of the reading study is said to show no absolute loss for the general population, for Compensatory Education (CE) students, or for Title I students. However, CE students make smaller gains over the summer than non-CE students, and the report cites this as evidence that there is a relative loss in achievement gains for CE students. (Author/JCD)

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REPORT #8:
SUMMER GROWTH AND THE EFFECTIVENESS OF SUMMER SCHOOL

Leonard S. Klibanoff
Sue A. Haggart

TECHNICAL REPORT # 8 FROM THE
STUDY OF THE SUSTAINING EFFECTS OF COMPENSATORY
EDUCATION ON BASIC SKILLS

PREPARED FOR THE
OFFICE OF PROGRAM EVALUATION,
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BY

RMC RESEARCH CORPORATION
2570 W. EL CAMINO REAL
MOUNTAIN VIEW, CA 94040

Under Contract With

SYSTEM DEVELOPMENT CORPORATION
2500 COLORADO AVENUE
SANTA MONICA, CALIFORNIA 90406

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9A. The SES Staff. A Compilation of The Instruments Used in the Sustaining Effects Study. System Development Corporation, Santa Monica, California, April 1979.

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THE STAFF OF THE STUDY OF SUSTAINING EFFECTS

SYSTEM DEVELOPMENT CORPORATION:

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Functional Effectiveness Measures. Mary Spencer, Manager (1975–1976); David Bessemer (1975–1976); Nicolas Fedan (1975–1976); Bobby Offutt (1975–1976).

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A REVIEW OF THE SUSTAINING EFFECTS STUDY AND AN OVERVIEW OF THE PRESENT VOLUME

REVIEW

In response to questions about education policies, SDC and its subcontractors are studying compensatory education (CE); its nature, quantity, and environment; its sustained effects; and its generality, in a large study called: The Sustaining Effects Study. This thorough study will result in a series of reports from the following sub-studies:

The Longitudinal Study. In the Longitudinal Study, the growth of children in reading, math, functional literacy, and attitudes toward school were assessed in the fall and spring for three consecutive years. The amount and kind of instruction in reading and math was also determined for each student. In addition, teachers and principals reported on their practices of instruction and teaching. Thus, it was possible not only to assess student growth over a three-year period, but to relate this growth to the instruction.

The schools in the study were drawn from three different groups. The *Representative Sample* of schools is a sample carefully drawn to represent all of the nation's public schools that have some of the grades one-through-six. A second group of schools, the *Comparison Sample,* is composed of schools that have large proportions of students from poor homes but do not receive special funds to offer CE services. The third group is the *Nominated Sample,* composed of schools nominated because their educational programs had promise of being effective for low-achieving students. During the first year of the study, data were collected from 328 schools and about 118,000 students.

The Cost/Effectiveness Study. Information was obtained on the resources and services to which each student was exposed during reading and math instruction. Cost estimates were generated on the basis of this information. Because the effectiveness of the instructional programs is being determined in the Longitudinal Study, it will be possible to relate the effectiveness to the cost of each program.

The Participation Study. The purpose of the Participation Study was to determine the relationships among economic status, educational need, and instructional services received. The educational achievement of the students and the services they received were obtained in the Longitudinal Study, and the refined measures of economic status were obtained in the Participation Study. Visits were made to the homes of over 15,000 randomly selected students from the schools in the first-year *Representative Sample.* During the visits, information was collected on the economic level of the home and on the parents' attitudes toward their children's school and learning experiences. Thus, the level of student achievement and services could be related to the economic level of a student's home.

The Summer Study. The Sustaining Effects Study also examined the effectiveness and cost-effectiveness of summer-school programs. Information about the summer school experiences of the students was combined with other SES data. The resource-cost model, developed for the regular-year, cost-effectiveness studies, was adapted to the needs of the summer-school study.

Successful Practices in High-Poverty Schools. This study is intended to identify and describe instructional practices and contexts that appear to be effective in raising the reading and math achievements of educationally disadvantaged students. In-depth observational and interview data were collected from 55 schools that are participating in the SES.

The Report Series

The major findings of the reports already published are discussed briefly below, along with references to the specific reports from the SES that address them.

A Description of Student Selection for CE as it Relates to Economic Status and Academic Achievement. The Education Amendments of 1974 required several studies to provide the information necessary for the improvement of allocation formulas and other aspects of the Title I program that would be incorporated into the reauthorization of Title I in 1978. One of the major unanswered questions that Congress had posed was concerned with just who received the services provided under Title I funds. Some members of Congress had been considering altering the allocation intentions of Title I to stress economic disadvantage less and educational disadvantagement more. In addition to any political differences that might be expected to enter into a discussion of such changes, there was also concern about just how different the results would be under several allocation formulas. Clearly, in order to make a decision based on more than simple political expedience, Congress required information on the following questions:

1. How many *economically* needy children *do* and *do not* participate in Title I?
2. How many *educationally* needy children *do* and *do not* participate in Title I?
3. How is Title I participation related to economic and educational need, jointly?
4. What kinds of educational services are received by economically and educationally disadvantaged children that are different from those received by non-disadvantaged children?
5. How are Title I participation and academic achievement related to the children's home environments, their parents' participation in and awareness of their education, and the parents' satisfaction with the educational services that their children receive?

These questions were addressed in Technical Reports #2 (Breglio, Hinckley, and Beal, 1978),

#3 (Hinckley, Beal, and Breglio, 1978), and #4 (Hinckley, Beal, Breglio, Haertel, and Wiley, 1979). A brief summary of answers to the five questions is provided below.

1. About 29 percent of poor students participate in Title I compared to about 11 percent of the non-poor students (Report #2). Looking at CE in general, about 40 percent of the poor students and about 21 percent of the non-poor students participate. From these findings, we can see that proportionally more poor students participate in CE services than non-poor ones.

2. Using the grade-equivalent metric (one year below expectation for the student's current grade) as the definition for educational disadvantagement, about 31 percent of the low-achieving students participate in Title I, while only 10 percent of the regular-achieving students do (Report #2). For CE in general, the percentages are 46 for low-achievers and 19 for regular-achievers. Among the regular-achievers who participate in CE, many score below the national median on achievement tests.

3. Participation rates for Title I and for CE in general are highest for students who are both economically and educationally disadvantaged (Report #2). Forty-one percent of these students participate in Title I, and 54 percent participate in CE in general. Participation rates are next highest for students who are educationally but not economically needy (26 and 41 percent, respectively), and next highest for students economically but not educationally needy (20 and 28 percent respectively). Only 7 percent of the students who are neither educationally nor economically needy participate in Title I (15 percent for CE in general). These participation rates were interpreted as indicating that the then-current allocation procedures were being complied with, and the intentions of the law were being met fairly.

4. In comparison to non-poor students, poor students receive more hours of instruction per year with *special* teachers, more hours of instruction in medium- and small-sized groups, fewer hours of independent study, and more non-academic services such as guidance, counseling, health and nutrition (Report #3). The differences are even stronger when poor Title I students are compared to others. Therefore, we can conclude that the distribution of educational services is in line with the intent of the laws and regulations.

5. Two aspects of the children's home environments bore significant and consistent relations to achievement: amount of reading done at home and the educational attainment of the head of the household. Other variables, such as family size, TV-watching behavior, and type of living quarters were not consistently related to student achievement (Report #4). Although most parents (67 percent) know whether their children's schools have special programs for low-achieving students, few (40 percent) knew of Title I and even fewer knew of or participated in the local governance of the Title I program. Poor parents, in general, are less involved in their children's educational programs, have lower expectations of their children's attainments, give lower ratings to the quality of their children's educations, but perceive Title I and other CE programs as being helpful.

Description of the Nature of CE Programs, Characteristics of Participating Students, Schools, and Educational Services. The Participation Study dealt almost exclusively with what has been called 'selection for receipt of CE or Title I', without examining too closely what such programs really are and how they differ from the programs regularly offered by the schools. Before we could draw any relationships between selection, receipt, or participation in a CE program and the academic achievement of students, we had to be assured that there really was a program that was distinct, could be specified in some way, and had a reasonable chance of making an impact (otherwise, we would simply be making comparisons on the basis of assignment labels). As will be seen, not only did we analyze data on the basis of assignment labels, but we also considered the actual services received in order to directly address the possible differences between the intention and the actuality.

Based on the analyses of data obtained from about 81,500 students in the Representative Samples, Technical Report #5 (Wang, Hoepfner, Zagorski, Hemenway, Brown, and Bear, 1978) provides the following important conclusions:

- Students participating in CE are lower achievers (mean score at the 32nd percentile) than non-participants (53rd percentile). Seventy percent of the participants were judged by their teachers as needing CE, while only 19 percent of those not participating were so judged. More minority students participate in CE, proportionally, than majority students, but participation in CE has little relationship with student attitudes towards school, early school experiences, summer experiences, or the involvement of their parents in their educational programs.
- Minority, poor, and low-achieving students tend to receive more hours of instruction in smaller groups and by special teachers, and receive more non-academic services, but their attendance rates are generally lower too, so they do not take maximum advantage of the special services provided.
- The useful predictors of whether or not a student is selected to receive CE are his/her teacher's judgment of need and participation in CE in the previous year. When these variables are considered, achievement scores, non-English language spoken in the home, and economic status contribute little more to the prediction.
- About two-thirds of the students participating in CE in 1975-76 participated in the 1976-77 school year also.
- CE students in general and Title I students in particular receive more hours of instruction per year than non-CE students. The CE students also receive more hours of instruction from special teachers. Among CE students, Title I students receive the greatest number of hours of instruction, more frequently with special teachers, and in small instructional groups. There are no significant and consistent differences between CE students and non-CE students with regard to their teachers' instructional sub-grouping practices, use of lesson plans, extent of individualization of instruction, frequency of feedback, or assignment of homework.
- Students receive between 5 to 9 hours of reading instruction per week, decreasing steadily with higher grades, and between 5 and 6 hours of math instruction per week, fairly constant over all grades.
- CE services are delivered during regular instructional hours with different kinds of

activities for the participants (so that, in effect, they 'miss' the regular instruction received by their non-participating peers).

- Title I schools have higher average per-participant CE expenditures in reading and math than do schools with other CE programs. The average Title I per-participant expenditure is about 35 percent of the average per-pupil regular (base) expenditure.
- Schools receiving CE generally have larger enrollments, higher concentrations of poor students and low-achieving students, and students with less educated parents. These schools have greater administrative and instructional control by their districts and have higher staff-to-student ratios.
- Schools that select higher percentages of regular-achieving students for receipt of CE services have larger percentages of minority and poor students, probably reflecting their tendency for saturation of CE programs.
- Most districts use counts of students receiving reduced-price lunches, and counts of aid to families with dependent children, to determine school eligibility, while most schools select students on the basis of standardized achievement tests, frequently augmented by teacher judgments. Similar selection criteria are employed by non-public schools.

Cost-Effectiveness of Compensatory Education. In its deliberations for the reauthorization of Title I, Congress also wanted information on the effectiveness of the Title I program relative to its cost. While it appears eminently sensible to ask the question of cost-effectiveness, it is difficult to provide the answers in a manner that will be interpreted correctly. By analogy, the results of a cost-effectiveness study are likely to be that 'it's more cost effective to miss a bus than a taxi'.

In the study of cost-effectiveness of CE, efforts were made to preclude such enigmatic conclusions and, at the same time, to make cost estimates on a sounder basis than in the past. In Technical Report #6, Haggart, Klibanoff, Sumner, and Williams (1978) developed and presented a resource-cost model that translates the measures of resource exposure into estimates of standard dollar costs for each student's instructional program. The overall strategy for estimating costs provides a dollar metric that reflects the measure of individual resource exposure, accommodates interregional price differences, is insensitive to the differential effectiveness of purchasing departments in obtaining the best buys, and is sensitive in discerning intra-classroom differences among the instructional programs on an equitable basis that is not confounded with other economic issues.

Using the resource-costs, CE students in general, and Title I students in particular, were found to be offered substantially higher levels of educational resources, and hence more costly programs. Participation in CE differentiates the resource-costs for services offered much more than do poverty, achievement level, race, or any other characteristics.

In Technical Report #7, Sumner, Klibanoff, and Haggart (1979) related resource-costs to achievement to arrive at an index of cost-effectiveness. The results of the analyses were nonetheless subject to the invidious interpretations suggested by the analogy above. Due to the low-achievement levels of the children selected for CE and their relatively slow rates of achievement growth, the increased costs associated with CE appeared to be misspent (in the same way that money for severely ill and terminal patients appears to be not as effectively spent as it is for mildly ill patients). It is important to point out, however, that the appearance may not tell the true story. Because we can't obtain truly appropriate comparison groups, we don't know what would have happened to the achievement growth of the CE students if they had not participated. Based on the comparison groups we could form, however, CE programs did not appear to have an advantage over regular programs in terms of cost-effectiveness.

The Effectiveness of Summer-School Programs. The SES also studied the results of attendance at summer school, because Congress had an interest in knowing if such attendance were the key to the prevention of the assumed progressive achievement-deficit of low-achieving students. If we could find that attendance at summer school had positive academic effects insofar as the attendees didn't 'fall back' to the achievement levels of previous years, then Congress would want to consider increased funding for or advocacy of summer instruction in the new authorization for Title I.

Studies Still to Be Done. The remaining reports, yet to emanate from the SES, will address the general effects of educational practices on raising students' achievement levels, with special attention paid to the practices found in CE programs in general and in Title I programs in particular. Impact analyses will either be based on three-year longitudinal data or will be based on in-depth observations and interviews. The extensive achievement-data collected from overlapping cohorts of students in the three years will be utilized to describe the pattern of educational growth over the years for various groups of CE and non-CE students. Analyses of the three-year longitudinal data will allow us further to examine the sustained effects of CE and help us to determine if the presumed phenomenon of gap-widening between the disadvantaged and non-disadvantaged student indeed exists. Using multiple approaches to the evaluation of CE, the SES strives to uncover in a reliable manner the effects and effectiveness of the nation's efforts in compensatory education.

OVERVIEW

This is the eighth technical report in the series of reports from the Study of the Sustaining Effects of Compensatory Education on Basic Skills (known as the SES). It reports on a study of student achievement growth over the summer and of the effects and cost/effectiveness of summer school. The study is limited to students in the elementary grades and examines instructional programs and outcomes solely for reading and math. The key results of the study are:

1) Summer schools are available to about one-half of all elementary school students. Schools having large enrollments tend to offer summer school.

2) Students who attend summer school tend to be low achievers and are more likely to be Compensatory Education (CE) students.

3) The amount and cost of instruction in summer schools are quite low. Generally, in summer school there are 17 hours of reading and 15 hours of math offered throughout a 5-6 week period.

4) No tendency is discernable for students to lose school-year gains over the summer;

all students tend to grow in achievement over the summer. The amount of growth is greater in reading than in math. CE students show a slight tendency to grow at a slower rate over the summer than regular students, thus exhibiting a slight "relative loss."

5) Students who attend summer school grow at the same rate over the summer as students who do not attend summer school. This finding casts doubts on the academic effectiveness or cost-effectiveness of summer school as presently conducted, but must be interpreted cautiously in view of the small amount of instruction currently available in summer school programs.

The following material gives a more detailed overview of the report.

The Focus and Methods of This Study

The analytic focus is on four areas of investigation:

- The first area deals with the nature of summer school and, more specifically, with reading and math programs.
- The second area deals with the pattern of growth in student achievement over the summer; specifically, it deals with the posited phenomenon of CE students losing much of their school-year achievement gains during summer.
- The third area concerns the effectiveness of summer school with regard to growth in achievement.
- The fourth area investigates the effectiveness and cost/effectiveness of alternative summer programs.

The study is based on two samples of students. The first includes approximately 39,000 students from the 1976-77 school year (who continued into the second year of the study and who were present for the fall, spring and subsequent fall test administrations), and on about 5,600 students who reported attending some formal summer school in 1977. The second sample comes from 52 summer-school programs operated in 1977, and provides a basis for assessing the effects of alternative summer programs and for describing the reading and math programs offered to the 2,500 students who attended summer school at these schools.

Method for Estimating Cost

The cost of instructional programs is estimated for each student who receives reading or math instruction in summer school. A student's program cost is a measure of the resources used in providing his instruction. This cost, a dollar metric that reflects student exposure to resources, is expressed in standard resource dollars (SRDs). This cost includes only those resources that differentiate one student's instructional program from another's. It does not include, for example, the cost of classroom space or the cost of the administration of the program.

Outcome Measures

Student academic achievement in reading and math was assessed by Form S of the Comprehensive Tests of Basic Skills (CTBS). Fall and spring percentile norms and vertical-scale conversions were developed, using the projected national score distributions from the SES in the first year of the study. In addition, during the first year, at-level and below-level tests were administered. Analysis of these test scores resulted in the selection of a recommended-level test score for each grade at each school. The recommended-level was selected in order to reduce floor and ceiling effects. They are the test scores used in this report. Summer growth is assessed by subtracting spring achievement scores from the ensuing fall scores.

Major Findings

The important findings of this study are summarized below, organized around the policy questions that guided the research effort.

What Are the Characteristics of Schools that Have Summer Programs Available to Their Students?

It was found that summer school programs are available to students in 51 percent of the schools. Schools that have summer programs available for their students tend to have enrollments greater than 400 students. Summer school is more likely to be available in schools with low percentages of poverty students than in schools with high percentages. There is little relationship between the availability of summer school and the concentration of low-achieving students in schools.

What Are the Characteristics of Students Who Attend Summer Programs?

By and large, students who do attend summer school have lower achievement scores, in both reading and math. The mean percentile scores for the 5,600 students (in the fully longitudinal sample) who reported attending summer school are shown below for three test administrations.

In the SES sample, students who receive CE are much more likely to attend summer school than are non-CE students. Within cohorts, the percentage of CE students who attended ranges from 21 to 32, while the percentage of non-CE students who attended ranges from 7 to 20. Viewed in terms of percentages of all summer school attendees, CE students represent 43 percent of the total, with Title I students representing the largest group.

Mean Reading and Math Percentile Scores for All Cohorts and Three Test Administrations by Summer School Attendance

Summer School Attendance	Fall, 1976		Spring, 1977		Fall, 1977	
	Reading	Math	Reading	Math	Reading	Math
Attended	35.8	38.0	35.6	38.3	38.8	41.3
Did Not Attend	47.5	48.1	48.1	48.9	51.0	51.0

What Are the Costs of Resources Used in Summer Reading and Math Programs?

In standard resource dollars the mean total costs of the resources used in reading and math instruction received by the students in various selection categories, and for each cohort, are shown below. The mean cost for reading ranges from a low of $24 to a high of $36. Title I and Other-CE students, in all cohorts but one, have higher reading program costs than do non-CE students. For math, the range is from $13 to $34. Title I students, except for those in one cohort, have lower mean costs than do either Other-CE or non-CE students.

Summer Program Cost in Reading and Math by CE Selection Category (Cost in Standard Resource Dollars)

Cohort	Title I		Other-CE		Non-CE	
	Reading	Math	Reading	Math	Reading	Math
1-2	$32	$13	$33	$24	$25	$19
2-3	$31	$20	$31	$22	$27	$21
3-4	$28	$16	$29	$19	$25	$23
4-5	$26	$22	$31	$34	$24	$19
5-6	$28	$18	$36	$27	$30	$20

The cost-data shown above indicates that summer programs do not provide intensive academic services. Other evidence for this conclusion can be seen in the data on the hours of instruction actually received by students in summer programs over a five-to-six week period. The average program hours for the three CE-Selection categories are shown below.

Summer Program Hours in Reading and Math by CE Selection Category

Cohort	Title I		Other-CE		Non-CE	
	Reading	Math	Reading	Math	Reading	Math
1-2	17	8	18	15	17	13
2-3	17	14	20	14	18	16
3-4	15	11	19	13	15	16
4-5	16	14	21	18	15	14
5-6	17	12	17	16	20	14

What Combinations of Instructional Resources (Program Components) Are Used in Summer Programs and How Much Do They Cost?

Combinations of program components and their costs are listed in the table below.

Viewed on the basis of cost-per-hour, the differences among groups of students are not large. However, the differences that do exist tend to show higher costs associated with students who were CE selectees in the previous school year, as well as students in the lower two quarters of the achievement distribution.

Another finding, not unexpected, is that the number of students who spend time with a student or adult volunteer tutor increases for the higher grade cohorts. Roughly one half of the students spend some of their instructional time working independently with programmed learning materials. Consistently, almost all students in all cohorts spend some time working independently with non-programmed materials.

Do Students Maintain Their Achievement Growth Over the Summer Months?

This question examines the alleged existence of a decline in test scores on the part of students over the summer. The figure below shows the longitudinal achievement data for five cohorts of students. An absolute drop-off does not generally occur. For reading, none of the cohorts exhibits an average test score (Fall, 1977) lower than that obtained during the preceding spring. The pattern is similar in math, although one drop-off of four points occurs in cohort 4-5. Overall, in fact, students appear to make small increases in achievement over the summer, though at a slower rate than during the regular school year. (However, the apparent gain over the summer may be at least partially attributable to the fact that the interval between spring and fall testing includes brief periods of regular-year instruction.)

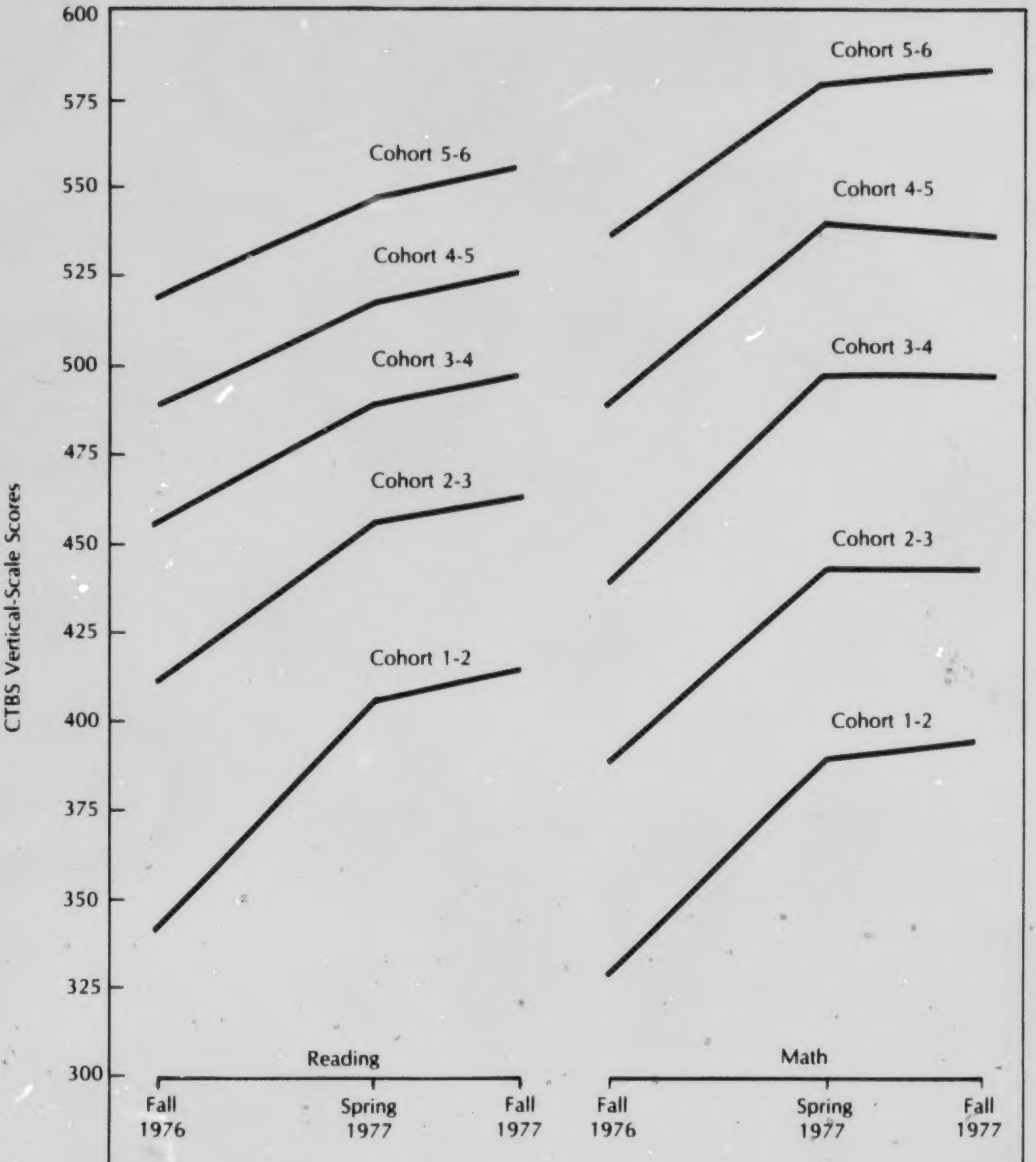
Cost-Per-Hour of the Program Components Used in Summer-School Programs

Program Components	Cost Per Hour	
	Reading	Math
Classroom teacher provides instruction for the whole class (21 or more students)	$0.85	$0.80
Classroom teacher provides instruction to a large group (14-20 students)	1.15	1.15
Classroom teacher provides instruction to a medium-size group (7-13 students)	1.55	1.55
Classroom teacher provides instruction to a small group (2-6 students)	3.25	3.25
Teaching assistant/aide works under the direction of the classroom teacher	1.10	1.10
Special teacher provides instruction for the whole class (21 or more students)	0.85	0.70
Special teacher provides instruction to a large group (14-20 students)	1.00	0.90
Special teacher provides instruction to a medium-size group (7-13 students)	1.30	1.05
Special teacher provides instruction to a small group (2-6 students)	3.30	3.25
Teaching assistant/aide works under the direction of the special teacher	0.95	1.05
Tutoring by another student or by a volunteer	0.40	0.40
Independent study using programmed materials	0.55	0.55
Independent study using non-programmed materials	0.45	0.45

Is Achievement Growth Over the Summer Different for Various Groups of Students?

The table below displays the mean summer reading and math gains (expressed both as vertical-scale scores (VSS) and percentile ranks) for CE and non-CE students.

With the exceptions of the declines in math VSS scores for cohorts 3-4 and 4-5, the results displayed in the table above do not provide much support for the notion of an absolute loss over the summer for either CE or non-CE students. It is also clear from the data, however, that the gains made during the summer by CE students are somewhat smaller than those made



Reading and Math CTBS Scores for Five Cohorts Over Three Test Administrations by non-CE students. This result is consistent with summer loss in the relative sense. That is, CE students appear not to progress quite as much during the summer as their non-CE peers. This relative loss is clearly more evident in reading than in math.

Mean Summer Reading and Math Gains (VSS and Percentile) for Five Cohorts for CE and Non-CE Students

Cohort CE Status	Spring-to-Fall Reading Gains VSS	Spring-to-Fall Reading Gains Percentile	Spring-to-Fall Math Gains VSS	Spring-to-Fall Math Gains Percentile
Cohort 1-2				
CE	6	5	1	2
Non-CE	11	3	5	4
Cohort 2-3				
CE	5	3	5	5
Non-CE	8	4	0	3
Cohort 3-4				
CE	1	2	−1	1
Non-CE	11	5	1	3
Cohort 4-5				
CE	3	2	−1	2
Non-CE	9	3	−5	0
Cohort 5-6				
CE	4	1	4	3
Non-CE	10	3	1	3

When summer achievement patterns for Title I students are compared with those for the full cohorts of students, no meaningful differences are apparent. The same small increases, but reduced rate of growth, are seen in reading; the same essential maintenance of growth is seen in math. Similar results were obtained for other subsets of the sample.

Summer Changes and Title I Projects' School Year Gains

	Summer Gains			
Cohort	Lowest*	Second	Third	Highest
		Reading		
1-2	11.85	5.77	1.61	–0.45
2-3	7.98	1.25	9.85	-2.47
3-4	8.57	1.55	0.40	–8.96
4-5	4.33	6.89	2.41	-6.90
5-6	8.06	7.15	3.53	1.54
		Math		
1-2	8.52	0.39	-1.54	–8.83
2-3	16.99	13.12	-5.34	–8.86
3-4	–4.09	-1.12	1.36	-10.74
4-5	0.79	2.25	–8.60	–8.45
5-6	12.43	10.60	0.39	–6.63

* Quarters of projects' school year gains.

Although the results summarized above rather clearly indicate both the absence of absolute loss over the summer and the quite minor magnitude of relative loss (which largely occurs in reading but not in math), other direct attempts to confirm the existence of summer-loss were undertaken. Data used in other studies were obtained from existing CE projects exhibiting high levels of school-year gains. The summer-loss phenomenon has also been directly related to the quality of school-year CE programs, as evidenced by the average gains attained in those projects. It has been proposed that the expected summer losses would occur among students in projects that show the largest gains during the school year. It has also been suggested that students in less-successful projects (i.e. those showing very small school-year gains) would exhibit little or no loss over the summer.

Our major attempt to replicate the findings of earlier studies showing summer loss involved an analysis of summer growth directly tied to the success of the school-year projects in which Title I students received their services. A project data-base was constructed. All students receiving Title I services at each grade level in each school were considered to be members of a Title I project. The projects were subsequently grouped into four levels of success based on average gains during the school year. The summer growth of students in projects in each level of gain were then analyzed. The results are shown below.

Mean Summer Reading and Math Score Gains (VSS and Percentiles) for Five Cohorts by Summer School Attendance for CE and Non-CE Students

Cohort Summer-School Attendance	Reading Summer Gains				Math Summer Gains			
	VSS		Percentile		VSS		Percentile	
	CE	Non-CE	CE	Non-CE	CE	Non-CE	CE	Non-CE
Cohort 1-2								
Attended	8	12	2	3	4	6	1	3
Not Attended	5	11	0	2	1	4	−1	2
Cohort 2-3								
Attended	5	7	3	5	9	2	8	4
Not Attended	4	8	4	3	2	−1	4	3
Cohort 3-4								
Attended	0	10	2	6	−1	−1	1	3
Not Attended	1	11	2	4	−2	2	1	3
Cohort 4-5								
Attended	1	10	1	4	1	−1	3	2
Not Attended	3	8	2	3	−2	−5	1	0
Cohort 5-6								
Attended	4	13	1	5	8	2	4	3
Not Attended	4	9	2	3	2	1	3	3

The results shown above indicate that, indeed, students in more successful Title I programs experience losses over the summer. In most cohorts, the losses are more than trivial. Balancing this, however, students in projects exhibiting the smallest gains during the school year typically show rather large gains over the summer. At both ends of the scale, measured changes appear to reflect measurement error rather than real phenomena. Hence, the relationship of summer-loss to the gains associated with school-year programs is not demonstrated by this data. These results along with the results of a similar analysis at the student level, in conjunction with the rather questionable nature of data used in other studies (please see Chapter 2) have led us to the conclusion that differential summer-losses associated with high or low gains during the regular school year are largely artifactual.

Is Summer School Effective in Promoting Achievement Growth?

Some basic data for assessing the effectiveness of summer school are shown, separately for reading and math, in the following two figures. The figures demonstrate quite similar patterns of growth over the summer for both attendees and non-attendees. Although the data, as shown, do not reflect initial achievement levels or socio-economic differences between attendees and non-attendees, they do indicate that, overall, summer school has little positive effect on subsequent test scores. (See Chapter 4.)

Other pertinent data associated with this question are also shown in the table below. The test data (VSS and percentiles) are shown for summer-school attendees and non-attendees, separately for CE and non-CE students.

Reading gains for attendees and non-attendees are quite similar. Among CE students, attendees gain an average of 3.6 VSS points while non-attendees gain an average of 3.4 points. In the non-CE group, summer attendees gain 10.4 points on average, with non-attendees gaining 9.4 points. An inspection of the percentile data indicates, again, the absence of any meaningful effect on reading. For math, the differences in VSS scores between attendees and non-attendees are small. CE attendees exhibit higher gains than do non-attendees. There are no significant differences between attendees and non-attendees in the non-CE group. The situation is similar for percentiles, with small achievement gains being the rule, along with an absence of large differences between attendees and non-attendees. This lack of effects persisted when various other subsets of students (such as Title I students) were separately examined.

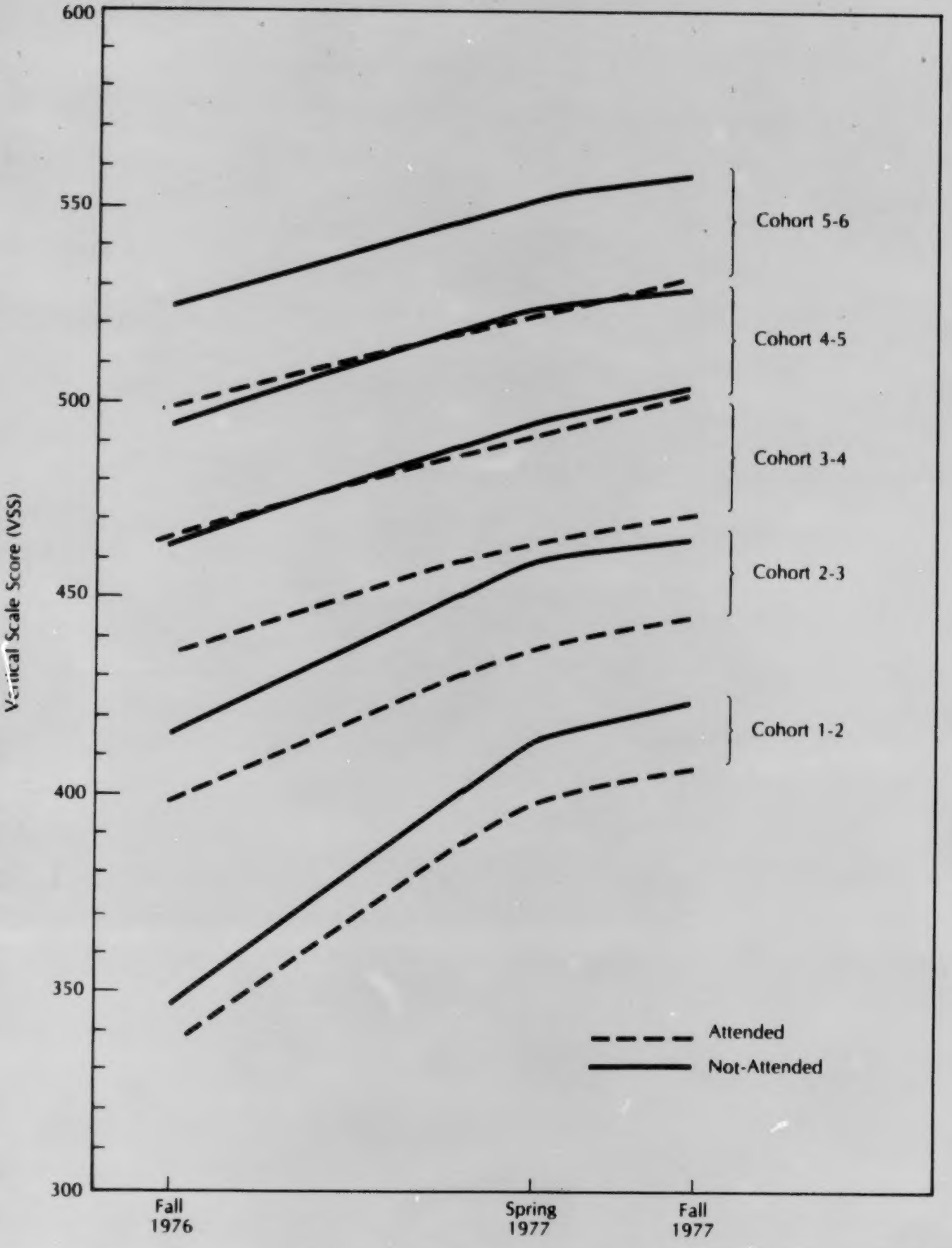
Regression analyses indicated that the attendance variable did not account for any appreciable amount of posttest variance over and above that accounted for by the pretest (spring) score. The regression results confirm the conclusion that summer school has little independent substantive effect on achievement growth. Similar results were obtained from a regression model including measures of family background and school socioeconomic characteristics.

At What Grade Levels Are Summer Programs More Effective?

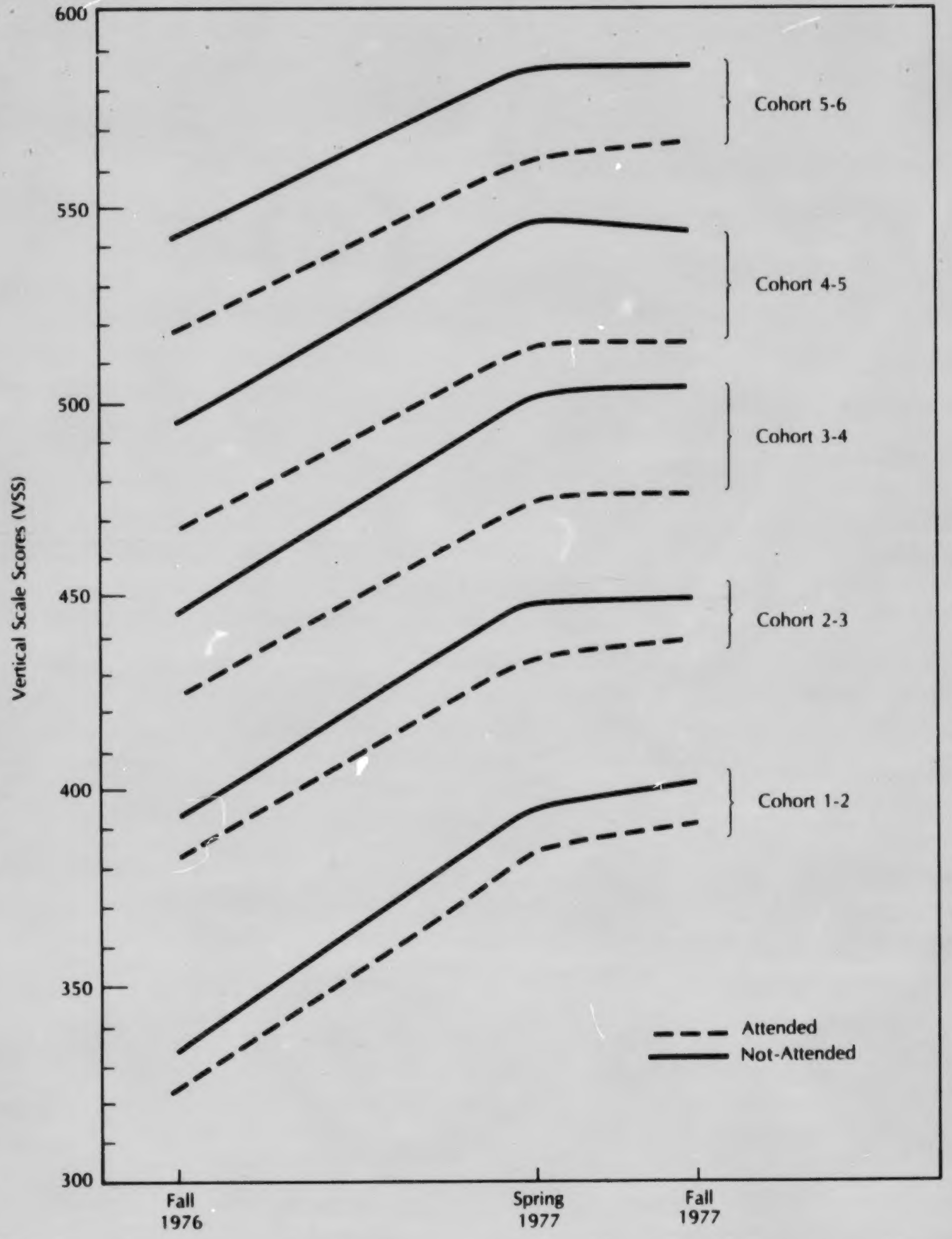
Based on the regressions that treated each cohort independently of CE status, it appears that there are no differential effects associated with summer school attendance. The results are similar for all cohorts, indicating that summer school is not differentially effective by grade level.

Do Students Who Attend Summer Programs Using More Resources Exhibit More Achievement Growth During the Summer?

The results of regression analyses did not indicate a positive relationship between resources used in summer programs and growth in student achievement. In general, the cost of summer



Reading Achievement by Summer School Attendance



Math Achievement by Summer School Attendance programs uniquely explained less than one percent of th[illegible]riance in the posttest scores. For three CE categories, within cohorts, the amounts of variance explained by attendance were also small. One relationship uncovered in the regression analyses was the tendency for students with lower pretest scores to receive more costly (intensive) programs in summer school.

What Combinations of Resources Are More Cost/Effective in Increasing Achievement Growth?

Generally, the use of the program-component costs did not help much to explain the posttest scores (as indexed by a comparison of the respective R^2 values) as compared to total cost alone. The regressions of achievement growth on the program-component costs do not provide strong support for the cost/effectiveness of any particular combinations of resources.

Summary

To summarize the overall results of this study in reading, no absolute summer loss exists for the general population, for CE in general or for Title I students in particular. The results also indicate, however, that CE students tend to make smaller gains over the summer than do non-CE students. Hence some support is provided for the existence of a relative loss on the part of CE students. Perhaps more importantly, the size of the relative loss in reading was shown to be quite small in magnitude, never more than a few VSS points and even less when viewed relatively through the mechanism of average percentile ranks.

The math results, while generally consistent with those obtained in reading, do differ to the extent that all groups of students appear to show less positive growth over the summer than in reading; the case is one of a pause in growth rather than the typical small increases found in reading. However, the decline of CE students relative to non-CE students is less noticeable in the math results.

In neither reading nor math do our results support the conclusion that summer programs have a reliable positive relationship to growth in student achievement. The findings of this study, therefore, indicate that policy decisions to offer summer programs cannot be justified on the basis of achievement growth. CE students who do attend summer programs do not show reliably greater growth than either those CE students (or non-CE students) who do not attend summer school. Thus the results do not provide much, if any, support for the effectiveness or cost/effectiveness of summer school.

It is important to note, however, that these results speak only to the efficacy of summer programs as they are currently constituted. These programs are typically of brief duration and low intensity and it is probably unrealistic to expect such minimal programs to have any detectable effect on academic achievement.

CHAPTER 1. INTRODUCTION

This report documents the results of the study of the effects and cost/effectiveness of summer school. The study is limited to students in the elementary grades and examines only instructional programs and outcomes for reading and math. The emphases are on describing and comparing summer school for students in Title I programs, in Other-CE funded programs, or in regular instructional programs (all as based on CE selection or non-selection in the prior school year).

The SES provided a rare opportunity to assess the impact of summer school on a longitudinal sample of students. The longitudinal aspect of the achievement data was further enhanced by the acquisition of information on the resources and the costs of summer-school reading and math instruction for a sample of students attending summer school.

The analyses focus on four areas of investigation. The first area deals with the nature of summer school and, more specifically, reading and math programs. The second deals with the achievement growth of different groups of students. The effectiveness of summer school attendance with regard to growth in achievement is the third area examined. The effectiveness and cost/effectiveness of alternative summer reading and math programs are included in the fourth area of investigation. The major questions in each area are:

The Nature of Summer School

- What are the characteristics of schools that have summer programs available to their students?
- What are the characteristics of students who attend summer programs?
- What is the duration of summer programs?
- What are the costs of summer reading and math programs?
- What combinations of resources (program components) are used in summer programs and how much do they cost?

The Effectiveness of Summer School

- Do students maintain their achievement growth over the summer months?
- Is achievement growth over the summer different for various groups of students?
- Is summer school effective in promoting student achievement growth?
- At what grade levels are summer programs more effective?

Cost/Effectiveness Analyses

- Do students who attend summer school programs using more resources exhibit more achievement growth during the summer?

- What combination of resources (program components) used in summer programs are more cost/effective in increasing achievement growth?
- What are the relative cost and effectiveness measures of summer school as compared to academic-year programs?
- At what grade levels are summer programs more cost effective?

The study has two distinct, but mutually supportive, student data bases. The first includes data on students from the first-year sample of the SES who continued (in their SES schools) into the second year of the longitudinal study. This base provides the data for determining the overall course of achievement growth over the summer and for describing the characteristics of students who reported attending summer programs in 1977. The second data base contains programmatic data obtained from 52 summer school programs in 1977; it provides the basis for assessing the effects of alternative summer programs and for describing the reading and math programs offered in summer school. This data base also is our source of information for the cost and cost-effectiveness analyses.

The first, and larger, data base contains two-year SES data for approximately 39,000 students. Data on this fully longitudinal (i.e., over the three-test occasion) sample of 39,000 are used for the analyses in Chapter 4. About 15 percent of the students indicated that they attended some formal summer school during the summer 1977. This is slightly higher than the 11 percent reported in Technical Report #9 (Hemenway et al., 1978) for the Representative Sample in the preceding summer. The difference probably results from the decision made in the SES to invite schools from the Representative Sample of the first-year sample to continue participation in the second year of the SES partly on the likelihood that they would provide summer school for their students in 1977. This was done to maximize the number of students in the study who would attend summer school.

The smaller data base includes approximately 2,500 self-reported summer-school attendees. These are students who enrolled in programs at the 52 schools for which full instructional-program information (the basis for estimating cost) and achievement data were obtained. The sample includes only students attending summer school in SES schools. Program data were not obtained for SES students who attended summer school in other schools. The reasons for not following students to non-SES schools are discussed in Appendix A.

THE STRUCTURE OF THE STUDY

Each of the two data bases is used in a somewhat different but complementary manner. The two-year SES data, in addition to supplying all outcome and longitudinal data, provide information in support of the analyses of summer drop-off, as well as issues related to the overall effectiveness of summer programs. The smaller data base provides the information used to support the program descriptive, cost, and cost/effectiveness analyses.

Instruments Used in This Study

The purpose of the summer data collection at the 52 schools was to identify the resources that teachers used in providing instruction and the exposure (including attendance) of the students to those resources.

The instruments used in collecting data about the sample of summer schools and students were abridged versions of the Principal Questionnaire, Part B, and the Teacher Questionnaires, Parts A, B, and C, as used in the year-one SES. (These instruments are published in Technical Report No. 9A, Staff of the SES, 1979). The Student Participation and Attendance Record—the SPAR—was not used as a separate instrument. The SPAR responses on how students in a particular teacher's class spend the reading and/or math instructional time were obtained in two omnibus questions included in the Summer Teacher Questionnaire (STQ). The STQ had a few questions about the teacher's general instructional methods and included separate sections for describing the details of reading and math instruction. An item on student attendance was added to the summer version of the year-one Compensatory Education Record (CER) that recorded a student's selection for CE services. The summer instrument, the SCEAR, was completed by the summer-school coordinator and the teachers.

As in the year-one data collection, a summer student/teacher linkage roster was used to link students, solely by ID numbers, with the teachers providing instruction. The instruments, their purposes and the respondents are shown in Table 1-1.

Table 1-1

Instruments Used in the Summer Study

Instrument	Purpose	Respondent
Summer Principal Questionnaire (SPQ)	Obtains summer-school information	Summer-school principal
Summer Teacher Questionnaire (STQ)	Obtains instructional program information	Summer reading and math teachers
Summer Compensatory Education and Attendance Record (SCEAR)	Obtains student CE status and attendance	Summer-school coordinator
Student/Teacher Linkage Roster (STLR)	Links teachers and students by ID numbers	Coordinator and/ or teacher

Method For Estimating Cost*

The cost of resources used was estimated for each student who received reading or math instruction in summer school. A student's program cost is a measure of the resources used in providing instruction to him. This cost, a dollar-metric that reflects exposure to resources, is expressed in standard resource dollars (SRDs). For the summer school study, the method for estimating cost is, by design, the same as the method used in the cost analyses for Technical Reports #6 and #7. A resource-cost model was constructed as the means for translating the measures of resource-use into estimates of cost. The summer resource-cost model (SRCM), described in Appendix B, provides the total cost for a student's instructional program, and also cost subtotals that may be used in specific analyses.

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*A complete description of the methodology of estimating the cost of resources may be found in Technical Report #6 (Haggart, Klibanoff, Sumner, and Williams, 1978). The potential advantage of this cost methodology for studying cost-effectiveness relationships in education is discussed in Chapter 2 of Technical Report #7 (Sumner, Klibanoff, and Haggart, 1979)

It is likely that the cost estimates used in this report will be compared with estimates of other studies of summer school. Such comparisons are inappropriate because of the different items included in calculating cost. For this reason, a brief description of the method for estimating costs is provided as a basis for understanding the differences between our estimates and other estimates. The data obtained from the Summer Teacher Questionnaire describe each teacher's instructional program in terms of resource-quantities used. From this information, the amount of instructional time the student spends in four different sized groups, for a regular classroom teacher and, if applicable, for a special teacher, and the frequencies of use of equipment and materials are determined. Dollar values are assigned to a student's instructional program only after the kinds and quantities of resources utilized in that program have been specified. The use of resource-quantities as the measure allows the costs to reflect differences in resource levels utilized and differences in the ways resources are used.

Because we aggregate the resource quantities used at the classroom level, and then calculate the cost of these resources, the results are different from those obtained by dividing the dollar expenditures for a summer-school program by the number of students enrolled. The cost we calculate includes only those resources that differentiate one student's instructional program from another's. This cost does not include, for example, the cost of classroom space or the cost of the administration of the summer-school program.

In keeping with the spirit of the above paragraphs, we translate total variable resource requirements into estimates of comparable cost by using standard prices rather than district-specific prices. In comparing the various summer instructional programs, the cost figures reflect differences in the quantities of resources used. The costs estimated by using the method described can be equitably compared across summer-school programs operating in different districts. The cost comparability across districts also enables an analysis of the effectiveness resulting from the use of different amounts of resources in summer-school programs. With an adjustment to a cost-per-hour basis, the summer-program costs can be compared with the similarly adjusted regular-year program costs.

(Caveat: It is important to remember that these cost figures are not the same as expenditures, nor are they costs in the usual economic sense. Rather, they are a very special dollar-metric designed to measure student resource exposure. The metric is based on the application of standard prices to comparable resources and the resulting cost is identified in standard resource dollars (SRDs). Also, the metric measures only relevant instructional resources, excluding resources common to the operation of most programs or projects.)

Outcome Measures

Academic achievement in reading and math was assessed by Form S of the Comprehensive

Tests of Basic Skills (CTBS). Fall and spring percentile norms and vertical-scale scores (VSS) were developed by using the projected national score distributions from the SES in the first year of the study.

In addition, during the first year, at-level and below-level tests were administered to each student. An analysis of these test scores resulted in the selection of a recommended level for each grade at each school, in order to reduce floor and ceiling effects. In sum, the reading and math scores used are the vertically scaled, recommended-level CTBS test scores. A special sub-study identified and eliminated items thought to be racially or culturally biased. These debiased test scores are used in the analyses of this report. A full description of the measures of achievement may be found in Technical Report #9 (Hemenway, Wang, Kenoyer, Hoepfner, Bear, & Smith, 1978).

Because achievement growth during the summer is a critical variable in most of the analyses that follow, some explanation of how the growth was gauged is necessary. Summer growth is assessed by subtracting spring achievement scores from fall scores (similar to the way school-year growth is assessed by subtracting the fall from the spring score). Although this approach is a practical way to examine growth, some technical questions may arise.

First, variations in the length of the summer interval or, the school year interval among schools in the sample may make pooled results difficult to assess. This problem appears not to be very serious, however. In the entire SES sample, 87 percent of the schools have school years of between 171 and 185 days, with few schools differing by more than a few days. Therefore, the lengths of summer vacations are fairly similar for most schools and it is thus meaningful to talk of summer intervals and school-year intervals in general.

A second question arises from the testing schedule used and its possible affect on conclusions about summer growth. Since the schools in the SES were not compelled to participate, the dates on which children were tested could not be uniform. Based on discussions with teachers and administrators about when students are 'settled down', we recommended that schools test three weeks (with make-up testing at week four) after the beginning of school and five weeks before the end of school. Most schools conformed closely to the recommendations, and others tested at the closest possible alternative times.

With this testing schedule, then, more than the summer vacation is included between the fall and spring testings—about three weeks at the beginning and about five weeks at the end of the school year. Aside from allowing this time for students to 'settle down', many teachers agreed that significant achievement gains are unlikely to be observed during those periods.

Since the 'summer', as defined, may include up to eight weeks of the regular school year, it is possible that the achievement growth measured by subtracting spring from fall scores does not fairly represent what happens in the summer. The problem exists to the extent that learning occurs during the first three weeks of school and the last five weeks. It was felt, however, that, considering the teachers' judgments of growth during these periods and their assurance that testing *could not* be done during the first or last weeks, there was little practical alternative.

We can illustrate the problem further by using some data from Table 4-1 of this report. Consider the graph of the achievement growth in reading for cohort 2-3 in Figure 1-1. The figure illustrates the testing times, and assumes similar school-year growth in the following year (upper right). The solid dots indicate the observed achievement means located correctly in the school year, and the solid lines indicate the rate of growth between testings (assumed to be linear for the sake of simplicity and for lack of information to the contrary).

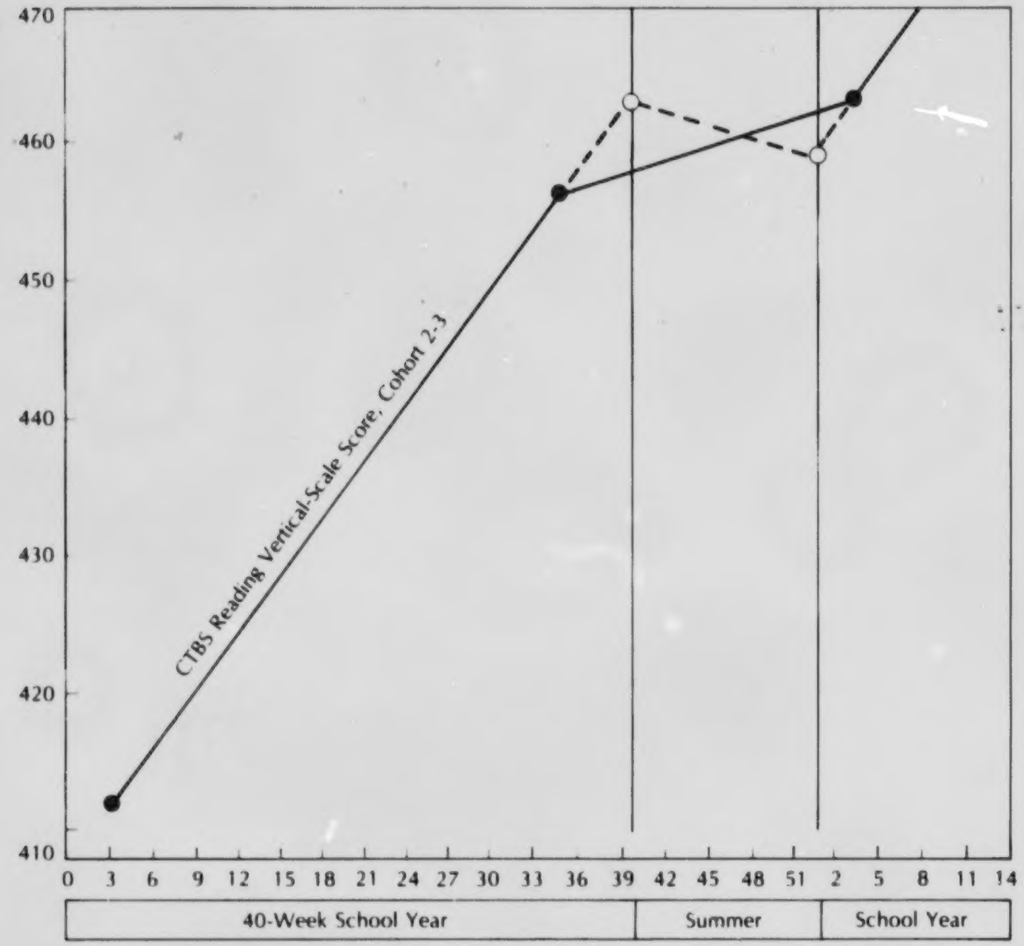

Figure 1-1
An Issue in the Measurement of Achievement Growth During the Summer

The empty dots represent what the mean achievement scores would have been if testing had occurred on the last day of school in spring and on the first day in fall, assuming that school-year growth remained linear during those unsettled weeks. If one accepts these possibilities, then the summer 'growth' is represented by the dashed line. Instead of the growth observed by our method, a 'drop-off' is observed. Clearly, the truth is likely to lie somewhere in between the two cases. It is our contention, however, that although our testing procedure may err in favor of finding positive growth during the summer, it is far more accurate than a (hypothetical) procedure that would indicate 'drop-off', but that makes specific assumptions about the linearity of cognitive growth. It might also be noted that other studies* of summer school have not solved this problem or even addressed it directly. It is typical that little or no information is provided on what effects the calendar dates of test administrations might have on the findings.

Regardless of the procedure used to assess summer growth, however, the comparisons among various groups ought to remain the same. Therefore, while some may dispute our findings of no absolute summer 'drop-off', they are less likely to take issue with other findings that result from the comparisons among groups of students on the basis of their summer growth.

ORGANIZATION OF THE REPORT

The organization of the substantive sections of this report is described as follows. In Chapter 2, we discuss some of the extant literature related to issues in summer schooling. The discussion covers three areas: achievement growth during the summer (including the summer-loss question), the effectiveness of summer school, and the cost and cost-effectiveness characteristics of summer programs.

In Chapter 3, we summarize the data on the availability of summer programs as uncovered in Technical Report #1 of the SES; we also describe the characteristics of those summer schools within the SES from which data were collected. The descriptions focus on the students who attended summer school and on measures of the academic intensity of the programs (program costs and information on the hours of reading and math instruction are the measures used).

Chapter 4 investigates, at some length, the summer achievement of various groups of students and the effectiveness of summer programs in maintaining and advancing student growth in achievement. The latter examination (of the effectiveness of summer school) takes the form of multiple displays of the achievement outcomes for various subsets of the student sample in conjunction with attendance at summer school. More formal tests of the effectiveness of summer school are examined by using multiple regression analysis.

The fifth and last chapter presents the results of the analysis of the cost-effectiveness of summer school. The cost data developed in Chapter 3 are used in conjunction with the achievement data. Also discussed is a comparison of the relative cost-effectiveness of summer programs as compared to school-year programs.

The report concludes with a series of Appendices designed to support the major analyses by providing information on the nature and conduct of the study, a description of the resource-cost model used to develop the estimates of the cost of the resources used in summer programs, and additional presentations of data relevant to the main analyses but considered too detailed for inclusion in the text.

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*The desirability and importance of testing hypotheses emanating from other studies (please see the following chapter) argues further against attempting to 'correct' the data by adjusting them for the typical dates upon which testing took place for the bulk of students at each school, since that 'correction' would result in the data of this report being non-comparable to those reported in other studies.

CHAPTER 2. BACKGROUND OF THE SUMMER STUDY

In this chapter we discuss two concerns that make a separate consideration of summer schools important for educational policy makers and of special interest within the framework of the SES. We do so by summarizing some facts and viewpoints that are related to the research/policy questions of this study. The first concern is the pattern of achievement growth over the summer months. The second is the effectiveness and, to a lesser degree, the cost/effectiveness of summer programs in basic skills.

ACHIEVEMENT GROWTH OVER THE SUMMER MONTHS

Within the context of the SES, our concern with the summer-vacation months stems from the larger issue of how to assist disadvantaged students to overcome the achievement gap between them and their non-disadvantaged peers. The question arises, quite naturally, as to whether or not achievement gains made by CE students during the school year are maintained in the absence of instruction over the summer. Specifically, a major question in CE is the potential existence of an achievement loss over the summer (the drop-off phenomenon) on the part of participants in CE programs.

Thomas and Pelavin (1976) report that their examination of State Title I evaluation reports uncovered a loss during the summer in the achievement level of Title I students. Other reports from SRI's Educational Policy Research Center (David and Pelavin, 1977; Pelavin and David, 1977) also report that Title I students, about whom we are most concerned, lose, over the summer, some of the academic gains obtained during the school year. It should be noted (NIE, 1978) that this drop-off or regression can be either relative or absolute. That is, children may forget or otherwise regress over the summer and 'know' less in the subsequent fall than they did in the preceding spring; or they may retrogress relative to a norm group. In the latter sense, the hypothesized drop-off consists of CE students not increasing their achievement over the summer by an amount required to maintain their relative standing with respect to national norms. Since some procedures used in norming tests assume that some portion of an academic year's growth occurs over the ten or so weeks of summer, this relative decline may be possible. The assumption of such linearity in cognitive growth, is, however, questionable (Tallmadge and Horst, 1974).

The summer drop-off would exist, then, if achievement levels were lower (in either the absolute or relative sense) in the fall than in the preceding spring. Should the summer drop-off prove to be more real than illusory, serious questions in the evaluation of CE would be raised. The implications would include, as Pelavin and David (1977) note, the judgment that school-year evaluations of CE would be of little value. It is argued that year-to-year evaluations would be necessary to provide a meaningful measure of a program's effectiveness. Moreover, if the decrement in performance is ameliorated by some types of summer programs, decisions on whether to allocate additional resources to summer programs could become critical for educational and social policy.

Few studies directly address summer drop-off in the absolute sense. Hayes and Grether (1969) offer some data that appear to be compatible with an absolute-loss model. They report, in a study of the New York City schools, that the cumulative effects of summer losses result in disadvantaged students being further behind their peers at the end of the sixth grade than earlier in their school careers.

The 'absolute decline' model is further compatible with the fan-spread formulation (Campbell and Boruch, 1975). The fan-spread indicates that CE students fall progressively further behind their non-CE peers as they move through elementary school. In the light of some data showing impressive school-year gains by Title I students, for example, the possibility exists that a disproportionate amount of the achievement gap emanates from an absolute summer drop-off. However, data reported by the NIE (1978) showed no absolute loss over the summer in the data of the Instructional Dimensions Study. Data reported by Heyns (1978) also fail to confirm general summer-losses.

It is possible that the drop-off observed in some studies may be attributable to the effects of differences in test norming procedures and/or to the metric chosen to present the data (i.e., grade equivalents) than to a true loss in achievement, either in a relative or an absolute sense. This possibility is quite compatible with some data that support the existence of student decline over the summer.

One difficulty in the body of research that has provided evidence for the existence of a substantial loss in achievement over the summer is the quality and type of data used in the studies. Much of the research reported by Thomas and Pelavin (1976) was based on State Annual Title I Evaluation Reports. This data base has been judged by other researchers to be inadequate to the task of providing useful impact data on Title I (Gamel, Tallmadge, Wood, and Binkley, 1975). The Pelavin and David study (1977) relied heavily on grade-equivalent scores from a single city in their analysis of summer losses among elementary school students. Similarly, David and Pelavin (1977) demonstrate the summer loss largely in terms of grade-equivalent scores.

As many researchers have pointed out, the grade-equivalent score is not a suitable metric for the expression of achievement growth. Aside from some logical difficulties encountered in their use, assumptions made by test publishers in the construction of grade-equivalent scores are likely to bias the evaluations in which they are used. A major difficulty associated with grade-equivalent scores is the tendency for such scores to overestimate the amount of gain made during the school year, caused by problems in interpolating fall norms from spring norms. It may well be that the summer loss on the part of students from whom substantial school-year gains were reported is a function of the overestimation of those school-year gains rather than of any summer drop-off.

Although the authors attempted to test the sensitivity of the results to variations in the test metric employed, they were unable to do so in the case of the one program that appears to provide the most support for the existence of summer loss. The data from that particular program (presented as the Omaha sample in the David and Pelavin study and/or the City M sample in the Pelavin and David report) is the only data set used that was generated from achievement tests having both fall and spring empirical norm data. Of the three data sets supporting the existence of summer loss, the Omaha (or City M) sample is also the only one providing data on elementary school students. The other two samples were obtained from compensatory programs operating at the junior high school level. Students participating in compensatory programs in grades seven and eight may, it can be posited, differ systematically from the bulk of CE students who participate at the elementary school level.

In addition, other difficulties present in the data available to the researchers at SRI may also have influenced the results as reported to an unknown but possible substantial degree. Many of the difficulties are not unique to the data used in the SRI reports, but rather are common in the use of existing data. For example, pooling results obtained from different achievement tests can affect the results. Also of concern is the lack of control over, or even knowledge of, the conditions under which the testing took place. The one data set that provided the least support for the existence of the summer loss in the SRI study was the only one of the four analyzed in which the achievement data were collected under the supervision of an independent research firm rather than by district or school personnel. In fact, the tests from the Omaha program were even scored by teachers participating in the program.

Whatever the totality of the problem inherent in the data used in the analysis reported out of the SRI Education Policy Research Center, the policy questions raised by those reports and the various hypotheses generated about summer loss remain important in their own right. One clear result of the SRI reports was the formation of two hypotheses regarding the nature of the perceived summer loss. First, as voiced in the David and Pelavin (1977) study, students who exhibit high levels of achievement gain during the school year tend to show large losses during the spring-to-fall period. An extension of that viewpoint to the project or program level was offered by Thomas (1978) who suggests that the success attained by CE projects in raising their students' test scores during the school year is directly related to the size of losses to be expected over the summer. In effect, students enrolled in CE projects with the greatest school-year gains would be expected to suffer the largest losses over the summer.

Because of the importance of the issues surrounding the summer-loss issue for the eventual formulation of policy in CE, both versions of the summer-loss hypothesis related to the level of school-year gains (individually by students and students as grouped on the basis of projects showing different levels of gain) are investigated as a part of the analyses presented in Chapter 4 of this report. We should note further that, at the level of individual students especially, large summer losses associated with rather large school-year gains may be reflecting, independent of the test metric employed in the analysis, severe regression-to-the-mean effects.

Despite the clear importance of the drop-off issue, remarkably little data exist to evaluate in a precise fashion how real the reported phenomenon is. Athough the reports of the drop-off enjoy some currency, so little is known about the normal course of cognitive growth over the summer for different groups of children in the absence of direct instruction that existing data are simply inconclusive on the question.

THE EFFECTIVENESS OF SUMMER SCHOOL

The existing base of information for assessing the effectiveness of summer school is neither large nor especially enlightening. While research indicates that attendance at summer school has little or no effect on subsequent test performance, the data descriptive of possible differences among summer programs are typically not available. Hence, a judgment that summer schools are not effective seems premature. At the same time, studies that purport to show some advantage accruing to children who do attend summer school are, themselves, subject to question. A sample of the available research is discussed below.

Austin, Rogers, and Walbesser (1972) reviewed the research on the effectiveness of summer compensatory programs. They concluded that teachers and principals believed that modest achievement gains were made by students who attended such programs. The authors also noted, however, that little in the way of objective measures of student progress was available in the studies they reviewed.

In a study in the New York City schools, Fox and Weinberg (1967) found that the median grade-equivalent score on the Metropolitan Achievement Test by summer students was increased about five points on the posttest. However, they also showed that some 30 percent of the students actually had a decline in test scores; 42 percent showed some gain, while 28 percent showed no gain or a loss. This result led to the supposition that the gains may have been due to chance and that the real impact of the program may have been quite small. The difficulty in interpreting the results for policy making stems from the absence of a comparison group in this and many other studies. That is, we do not know what would have happened to the students if they had not attended summer school.

Soar and Soar (1969) report summer gains of between three and five months in grade norms without attendance at summer school. They noted that the spring and fall tests were administered approximately five months apart and that the fall test was administered after the teachers had conducted review work for a month. Nevertheless, the conclusion was that summer gains were achieved in the absence of summer programs. Therefore, to attribute all gains to a summer program in an evaluation would necessarily bias the results in favor of the program.

Thomas (unpublished), in a study of students in the voucher demonstration program, reported that summer school does not appear to have any positive effect on the posttest scores. Thomas further concluded that while attendance at summer school does not appear to affect achievement, the summer months did result in a downward change in achievement scores, providing another source of support for the drop-off hypothesis. However, Thomas stipulated that the results stemmed from a natural experiment where there was no adequate comparison or control group. This problem was accentuated in the analysis that when all students were pooled in the regression analysis that was performed. Pooling assumes the same gains from summer school for all types of students. Since the validity of the assumption is not obvious, the results of the analysis must be questioned.

Each of the three summer studies mentioned thus far was conducted in individual school districts. This state of affairs is typical of studies of the effects of summer school on achievement. Along with the risky assumptions associated with those studies that treat attendance at summer school as a proxy for the actual treatment received by students, the local nature of most studies is one of the major inadequacies of existing research for judging the effectiveness of summer programs.

One study that did have a national focus (Wilson, 1966) examined certain characteristics of summer programs that were thought to be important. This study came to such broad conclusions (e.g., classrooms that were judged good were marked by a good rapport between the student and teacher) that it is not useful for helping to define a national policy toward summer school.

Al-Salam and Flynn (1976) correlated program characteristics of summer schools with measures of achievement. They could not identify any characteristic that was significantly related to effectiveness. Although the sample was national in scope, it consisted of only 27 schools —a sample size that the authors admit was so small that the results must be considered tenuous. Another problem was that there was little variation in the measure of effectiveness. The study employed an ordinal rating scale of above average, average, and below average. Of the 22 schools that were examined in the second grade, 16 were classified as average, while three each were classified as above and below average. This lack of variation in effectiveness would make it difficult to find a relationship between effectiveness and program characteristics, unless that relationship were extraordinarily strong.

The lack of an adequate control, or comparison group, other than that provided by questionable test norms, is a severe problem in most studies of summer school. The difficulty in assessing summer growth in a comparable non-treatment group is beyond the scope and budget of most studies. Moreover, given the non-compulsory nature of summer school, selection bias is a severe problem (Heyns, 1978).

THE COST AND COST/EFFECTIVENESS CHARACTERISTICS OF SUMMER SCHOOL

In order to measure the relative effectiveness or cost/effectiveness of alternative summer programs, a research design must necessarily include variations in summer-school programs. As was noted above, however, most of the research on summer schools has been conducted in single school districts. In these studies there was either no variation or insufficient variation among programs in the district on which to base judgments about the relative effectiveness of summer programs. Most studies were concerned only with attendance in summer school. Therefore, such studies can only indicate whether attendance at summer school is associated with higher achievement, and not whether there are differential effects among various types of summer schools, or whether differential effects are associated with the cost of summer programs.

The use of attendance as a proxy for summer-school programs would have validity if, in fact, summer-school programs were similar. Since data in support of this similarity are not available, differences (duration, intensity, content emphasis) in what constitutes a summer-school program should be considered. Using attendance as a proxy for summer-school treatment, then, may tend to mask the effects of any successful programs.

Research on the costs of summer school is also very sparse. One study was undertaken to survey costs in U.S. schools (Department of Defense, 1975), but had a sample size of only 25 schools, (only 17 of the schools provided usable data). A recent study by David (1978) presents some data on the cost of summer programs sponsored by Title I. David's results suggest that budget-based estimates of the per-pupil-hour costs are roughly equivalent to those incurred during the school year.

By far the most comprehensive examination of summer programs, however, was undertaken by Al-Salam and Flynn (1976). They reported that summer programs receiving Title I funds cost an average of 75 percent more per student than programs not receiving Title I funds. Al-Salam and Flynn also reported that summer programs that emphasized remedial or compensatory reading instruction were significantly more expensive than programs that were directed toward cultural enrichment.

The dearth of research on summer-school costs is understandable. Cost, when viewed in isolation from effectiveness, is not very relevant to policy making. Cost was, however, examined as one of the possible explanatory characteristics of successful summer programs in the Al-Salam and Flynn study, where the small sample size and the imperfect measure of effectiveness vitiated the results. That is, while a number of studies have attempted to look at the relationship between cost and effectiveness in regular education, the examination of this possible relationship has not been the focus of studies concerned with summer school. In fact, summer school as a discernible alternative treatment has not received much attention from the research community.

Useful evidence on the effectiveness and cost/effectiveness of summer programs in improving achievement is clearly inadequate. Since the issues raised by the effects of the discontinuance of schooling during the summer have important policy implications, the decision was made to conduct a separate summer study within the SES. As indicated in Chapter 1, this separate study draws upon the full complement of students and schools participating in the first two years of the SES to determine if there is a summer drop-off. Specific data about summer programs were collected from a sample of sites in order to address descriptive, cost, and cost/effectiveness questions of alternative summer programs.

CHAPTER 3. CHARACTERISTICS AND COSTS OF SUMMER SCHOOLS

This chapter discusses the percentage of schools offering summer school and the characteristics of schools offering such programs. The amount and kind of instruction offered in summer school are described. Also the costs of the resources used in summer instruction are provided. These data are the basis for addressing the descriptive questions of this chapter and the more inferential questions of Chapters 4 and 5.

In order to fulfill these purposes, we draw upon some previously published data from Technical Report #1 from the SES (Hoepfner, Zagorski, and Wellisch, 1977) on the availability of summer schools, on the utilization of summer school among students participating in the continuing two-year sample of the SES, and some of the data descriptive of the sample for the summer study that contributes to our analyses of the policy question dealing with cost and cost/effectiveness.

What Are the Characteristics of Schools That Have Summer Programs Available To Their Students?

One of the early tasks undertaken in the SES was a survey of elementary schools and districts throughout the nation. A 15-item questionnaire was responded to by 5,010 elementary-school principals and the results were projected to the total population of grade 1-6 schools. The survey established the data base from which the sample for the SES was drawn. The description and results of that survey are reported in Hoepfner, Zagorski, and Wellisch (1977).

Because of the concern among CE policy-makers with the maintenance of achievement gains over the summer, data relevant to the incidence and availability of summer schools were collected in that survey. Although the data have previously been published, we reproduce some of the pertinent tables from the Hoepfner et al. (1977) report in order to collect in one volume the available information descriptive of summer schools.

Table 3-1 displays the data collected in the survey on the numbers and percentages of public schools having and not having summer-school programs available to students. Summer-school programs are available to students in 51 percent of the schools having at least one of the elementary grades.

The data further indicate that a majority (52 percent) of summer programs are totally compensatory in nature. An additional 33 percent had some compensatory elements.

The data in Table 3-2 indicate that summer school is more likely to be available in schools with lower percentages of poverty students than in those with moderate percentages. Schools with very high poverty counts fall in between. We should note that the differences among the three classes of schools are fairly small.

Table 3-3 shows the percentages of schools having summer programs available in terms of minority enrollment levels. As Hoepfner and his colleagues note (page 119), "Schools with

Table 3-1

Projected Percentages of Schools With Grades in the 1-6 Range by Availability of Summer Programs and Enrollment

Enrollment in Grades 1-6	Summer School Availability: Summer School	Summer School Availability: No Summer School	Total Counts
1-100	23.5	76.5	5,704
101-200	38.5	61.5	12,087
201-300	53.1	46.9	12,523
301-400	56.0	44.0	12,723
401-500	63.9	36.1	8,255
501-600	60.3	39.7	5,152
601-700	61.2	38.8	2,723
701-800	63.5	36.5	1,608
801-1000	59.1	40.9	1,258
1001-2800	59.3	40.7	447
Total Counts	31,851	30,629	62,480

Table 3-2

Projected Percentages of Schools With Grades in the 1-6 Range by Student Poverty Level and Availability of Summer Programs

Percentage of Poverty Students	Summer School Availability: Summer School	Summer School Availability: No Summer School	Total Counts
0-20%	55.7	44.3	32,268
21-50%	44.3	55.7	20,164
51-100%	49.2	50.8	10,046
Total Counts	31,849	30,629	62,478

high concentrations of minority students tend to have more summer [programs] available to them than schools with low concentrations of minority students."

In their examination of the characteristics of schools having summer programs, the authors of Technical Report #1 report little relationship between summer-school availability and the concentration of low-achieving students in the school. The relevant data are reproduced in Table 3-4.

The national projections of summer school availability among schools that receive various types of CE funding are summarized in Table 3-5. The indication from the data is that, as Hoepfner et al. (page 119) state, " . . . schools that receive Title I funds are less likely to have summer school available to their students than schools that either receive other kinds of compensatory funds only, or that receive no compensatory funds."

Table 3-3

Projected Percentages of Schools With Grades in the 1-6 Range by Availability of Summer Programs and Minority Concentration

Percentage of Minority Students	Summer School Availability: Summer School	Summer School Availability: No Summer School	Total Counts
0-19%	48.7	51.3	42,732
20-49%	56.2	43.8	10,220
50-79%	50.5	49.5	4,526
80-100%	60.2	39.8	5,001
Total Counts	31,850	30,629	62,479

Table 3-4

Projected Percentages of Schools With Grades in the 1-6 Range by Availability of Summer Programs and Low-Achievement Rate

Percentage of Students Reading One Year or More Below Grade Level	Summer School Availability: Summer School	Summer School Availability: No Summer School	Total Counts
0-20%	54.0	46.0	31,719
21-50%	46.4	53.6	23,770
51-100%	52.8	47.2	6,988
Total Counts	31,849	30,628	62,477

Table 3-5

Projected Percentages of Schools With Grades in the 1-6 Range by Source of Compensatory Funds Received and Availability of Summer Programs

Compensatory Funding Source	Summer School Availability: Summer School	Summer School Availability: No Summer School	Total Counts
Title I Only	46.7	53.3	16,414
Title I and Other	46.5	53.5	25,739
Other Funds Only	59.9	40.1	8,934
No Special Funds	60.4	39.6	11,392
Total Counts	31,849	30,630	62,479

The authors also report data on the incidence of three alternative types of summer programs (compensatory, regular or enriched, and mixed programs). In terms of these three types of summer programs, they report that schools with a low percentage of poverty students are more likely to have the regular or enriched types of program than schools with higher levels of poor students. Further, when schools with high concentrations of minority students have summer programs available, the program is likely to be either a compensatory or a regular/enriched program. Last, Title I schools are more likely to have a CE-summer program available than are non-CE schools.

What Are the Characteristics of Students Who Attend Summer Programs?

We may now turn our attention to data descriptive of the SES students who attend schools with summer programs. The data presented and discussed below describe summer school from information for those schools continuing from the first to the second year of the SES.

Table 3-6 offers a comparison of summer attendees and non-attendees in terms of their vertical-scale scores. The reading and math scores are shown for all three of the available test administrations.

By and large, the data indicate that students who attend summer school have lower achievement levels at each of the two pre-summer test occasions. The differences are very consistent throughout the data of Table 3-6. Summer school attendees have lower achievement scores at each test administration than do non-attendees. This is true in both reading and math.

Table 3-7 presents a summary of the characteristics of summer-school attendees separately for each of the five year-one/year-two cohorts. The four characteristics shown in Table 3-7 are those that are of greatest interest to an understanding of who attends summer school: CE selection status, teachers' judgment of need for CE services, minority status, and participation in free-lunch programs. Differential attendance rates among the levels of these four characteristics provide some indication of the incidence of summer school attendance on the part of important subgroups of students.

The data clearly indicate that a higher percentage of CE students than of non-CE students are likely to attend summer school. The percentages of CE students who attend range from 21 to 32, while the percentages of non-CE students who attend summer school range from 7 to 20. With respect to the variable indicating teachers' judgments of need for CE services, twice the percentage of 'needy' students attend summer school than the percentage of 'not needy'. Notice that in Cohort 1-2, where judgments of achievement deficit and CE need are more difficult to make, the percentage of 'not needy' is larger. Both minority students and students who participate in the free-lunch program exhibit higher percentages of students attending summer school than their counterparts.

If attendance at summer school can be considered as an educational resource, the data shown in Table 3-7 are very consistent with the results reported by Haggart, Klibanoff, Sumner, and Williams (1978) in their analysis of resources used in providing CE services.

A final characteristic of summer-school attendees is shown in Table 3-8. This table displays the average affective-total score for longitudinal cohorts. Little or no difference in this affective

Table 3-6

Mean Achievement Scores by Summer School Attendance for Five Cohorts Over Three Test Administrations

	Fall 1976		Spring 1977		Fall 1977		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	N
Mean Reading Scores							
Cohort 1-2							
Attended	338	31	400	43	409	46	1054
Not-Attended	346	32	414	43	423	47	6515
Cohort 2-3							
Attended	399	45	440	48	446	51	1172
Not-Attended	416	49	461	52	468	54	6163
Cohort 3-4							
Attended	434	52	467	52	472	59	1388
Not-Attended	463	53	497	53	506	63	6295
Cohort 4-5							
Attended	464	63	494	64	500	69	1092
Not-Attended	493	60	524	62	531	66	6408
Cohort 5-6							
Attended	498	66	522	70	532	74	914
Not-Attended	524	63	551	68	560	72	6166
Mean Math Scores							
Cohort 1-2							
Attended	324	35	385	44	391	45	1060
Not-Attended	333	34	397	43	402	43	6518
Cohort 2-3							
Attended	382	46	434	52	438	51	1164
Not-Attended	394	44	449	50	449	49	6167
Cohort 3-4							
Attended	424	50	476	55	476	59	1389
Not-Attended	445	48	503	53	504	57	6244
Cohort 4-5							
Attended	468	59	518	66	518	66	1074
Not-Attended	496	58	548	63	543	63	6425
Cohort 5-6							
Attended	519	67	561	78	565	76	914
Not-Attended	542	63	586	71	587	71	6281

measure is evident between attendees and non-attendees. Interestingly, however, there appears to be a decline in the total affective score for both categories between the spring and fall test dates. This effect is somewhat more noticeable in the earlier grade levels. The low levels of reliability for the affective measure caution against a more substantive interpretation of these findings.

DESCRIPTION OF THE SAMPLE FOR THE SUMMER STUDY

The remainder of this chapter provides descriptive information on the sample of 52 sites that participated in the summer study. Some of these data address two specific policy questions

Table 3-7

Characteristics of Summer-School Attendees

Student Characteristics	Percentage Attending Summer School				
(During Regular School Year)	Cohort 1-2	Cohort 2-3	Cohort 3-4	Cohort 4-5	Cohort 5-6
CE Selection Category					
Title I Students in Title I Schools	24	24	31	24	21
Other-CE Students in Title I Schools	21	24	30	20	20
Other-CE Students in Other-CE Schools	25	32	28	31	23
Non-CE Students in Title I Schools	10	10	11	10	7
Non-CE Students in Other-CE Schools	12	12	14	12	16
Non-CE Students in Non-CE Schools	14	20	18	16	13
Teacher Judgment					
CE Needed	12	22	28	21	19
CE Not Needed	17	12	12	10	10
Student Status					
Minority	18	21	27	20	18
Non-Minority	11	13	12	10	9
Free Lunch Program					
Participant	17	20	24	19	17
Non-Participant	12	13	14	11	10

related to the academic nature and cost of summer programs. We begin our description with a tabulation of the 52 sites according to their standing within the sampling frame of the overall SES.

As noted, the summer-study sample consists of 52 schools. Table 3-9 tabulates summer programs by HEW region, district size and district poverty status for each of the three samples of the SES. Generally, the sample, as represented in Table 3-9, indicates that the data on summer programs is likely to represent a wide range of such programs in the nation. The reasons behind the decision to include only those summer schools held in an SES school in the data collection for the summer study are discussed in detail in Appendix A.

Table 3-8

Comparison of Total Affective Scores for Five Cohorts for Three Test Administrations

		Affective Scores	
Cohort	Fall 1976	Spring 1977	Fall 1977
1-2			
Attended	N/A	87	81
Not-Attended	N/A	86	81
2-3			
Attended	83	85	81
Not-Attended	83	84	81
3-4			
Attended	84	84	80
Not-Attended	82	82	78
4-5			
Attended	79	81	79
Not-Attended	79	79	77
5-6			
Attended	81	80	79
Not-Attended	79	78	76

Table 3-9

Distribution of Summer Study Schools by Geographic Region, District Size and District Poverty Status

Distribution Characteristics	Total Sample
Geographic Region	
New England	3
Metropolitan Northeast	3
Mid-Atlantic	4
Southeast	2
North Midwest	7
South Central	3
Central Midwest	4
North Central	5
Pacific Southwest	18
Pacific Northwest	3
Total	52
District Size	
Small	15
Medium	10
Large	27
Total	52
District Poverty Status	
High	10
Medium to High	22
Low to Medium	20
Total	52

Some Characteristics of Summer Programs

Before we provide the data on the final two policy questions addressed in this chapter—those that deal with academic focus and intensity, as well as the cost of summer programs—we offer a summary description of the nature of summer programs. The summary description is drawn from the responses of the summer-school principals. The data are displayed in Table 3-10. In general, the principals were asked for information on five descriptive features of their summer schools: school-wide instructional coordination, general instructional practices at the school, restrictions on student enrollment (separately, by remedial and regular), and sources of CE funding for the summer school.

Table 3-10

Characteristics of Summer Schools and Their Instructional Programs

Characteristics	Percentage of Summer Schools
Coordination of Instruction	
There is schoolwide coordination of the reading instruction program	58
There is schoolwide coordination of the math instruction program	52
Instructional Practices	
There are different achievement levels in the classroom	77
Students are assigned to classes by achievement	35
Ungraded classes are used	46
There is flexible scheduling of classes	38
Grade levels are mixed within classes	85
Enrollment Restrictions—Remedial	
Summer school provides remedial instruction	79
There are enrollment restrictions	36
Students must be recommended by teachers	36
Students must be one or more years below grade level	29
Students must be members of a target group	19
Students must pay a tuition fee	12
Enrollment Restrictions—Regular	
Summer school provides regular or enriched instruction	62
There are enrollment restrictions	44
Students must be recommended by teachers	10
Students must be one or more years below grade level	6
Students must pay a tuition fee	10
Types of Funding for Summer School	
ESEA Title I	44
Other federal funds	6
State CE funds	12
District CE funds	25
No special CE funds	36

Generally, a slight majority of summer principals indicated that there was school-wide coordination of the reading and math programs, 58 and 52 percent of the principals respectively. Frequently, children at different grade and achievement levels are taught in common classes during the summer, 85 and 77 percent of the schools. This parallels the relatively low percentage (35 percent) of students who are given classroom assignments on the basis of achievement levels. About half (46 percent) of the summer schools do report using ungraded classes. Flexible class scheduling is a common practice in only 38 percent of the schools.

The vast majority of the 52 sites offered instruction in remedial reading (79 percent) or remedial math (62 percent). Typically, restrictions on student enrollment in summer programs are more common in regular programs than in remedial programs.

The major source of CE funding for summer programs is Title I. Even though our sites in California were not considered as being funded by Title I (in 1977 California did not use Title I funds to support summer programs), 44 percent of the principals indicated receipt of Title I funds. Only 36 percent of the summer schools reported receiving no CE funds.

What Is the Duration of Summer Programs?

Table 3-11 displays the average duration of summer programs, in days, by district size, district concentration of poor students, and school size. The length of summer sessions shows some slight tendency to increase with increases in district size. Medium poverty districts offer programs that are longer in duration than either high or low poverty districts. Generally, the differences favor longer sessions (one week) in medium poverty districts. Large schools offer longer summer sessions than do small or medium size schools. The difference is more substantial (four to five days) between the large and small categories. The general range of session length is four to seven weeks, (of 3-hour days) with the average falling, as expected, in the five to six week category.

Table 3-11

Days in Summer Session by District Size, District Poverty, and School Size

Cohort	District Size			District Poverty			School Size		
	Small	Medium	Large	High	Medium	Low	Small	Medium	Large
1-2	26	25	28	22	29	23	25	26	29
2-3	25	26	28	22	30	25	24	26	29
3-4	25	26	28	22	29	25	24	26	29
4-5	26	29	28	23	29	25	25	28	29
5-6	27	29	28	26	30	23	26	28	30

With regard to these general findings, we should note that the sample sizes for the various panels of Table 3-12 are quite unequal. For example, only twenty percent of the summer programs were held at schools in medium size districts. Similarly, only ten of the sites were in high poverty districts. Fewer than one-third of the students attended small schools.

What Are the Costs of Instructional Resources Used in Summer Reading and Math Programs?

The analyses presented under this question and under the subsequent question employ the program resource data developed in the summer study to investigate the intensity of resource-use and to describe the ways resources are combined to provide summer instruction. The costs of the summer programs in reading and math are the costs of the resources used in providing instruction received by the students (Haggart, 1971, 1978).

Table 3-12

Summary Student Program Cost in Reading and Math, by CE Selection Category (Cost of Instructional Resources Received in Standard Resource Dollars)

Reading

Selection Category	Cohort 1-2		Cohort 2-3		Cohort 3-4		Cohort 4-5		Cohort 5-6	
	N	Cost	N	Cost	N	Cost	N	Cost	N	Cost
Title I	235	32	220	31	230	28	170	26	143	28
Other-CE	124	33	149	31	126	29	81	31	53	36
Non-CE	230	25	229	27	169	25	203	24	144	30

Math

Selection Category	Cohort 1-2		Cohort 2-3		Cohort 3-4		Cohort 4-5		Cohort 5-6	
	N	Cost	N	Cost	N	Cost	N	Cost	N	Cost
Title I	147	13	115	20	159	16	150	22	108	18
Other-CE	105	24	122	22	101	19	62	34	56	27
Non-CE	279	19	259	21	168	23	203	19	156	20

The summer resource cost model (SRCM) was designed as the means for translating the measures of student exposure-to-resources into estimates of individual student program costs, using standard prices for comparable resources. (See Appendix B.) The SRCM provides cost estimates in a dollar-metric that reflects our measures of student resource-exposure at the classroom level, accommodates interregional price differences, and is sensitive to interclassroom differences among instructional programs. The dollar metric, expressed as standard resource dollars (SRDs), permits cost comparisons among student instructional programs on an equitable basis. The comparability needed for this study is achieved by using the same price, or cost per use, for comparable resources or mixes of resources.

The data used in the resource analysis of regular-year CE (Haggart, Klibanoff, Sumner, and Williams, 1978) showed that CE students and students judged by their teachers to need CE services were *offered* substantially more resources than were their non-CE peers. In Technical Report # 7, (Sumner, Klibanoff, and Haggart, 1979), when the resources used and their costs were adjusted to a *received* basis, CE students still received higher-cost programs than non-CE students. The analyses of summer reading and math program costs and program component (combinations of resources) costs are based on the cost estimates of services *received;* the cost of services *offered,* however, is used to show the impact of student attendance on total program costs. Student attendance is the major factor contributing to the difference between the program resources offered and those received. In order to receive the benefit of a program or the exposure to resources a student must be present.

In this report, we also present program cost on a cost-per-hour basis. Because the cost-per-hour is independent of the total number of instructional hours received, the measure is free of the impacts of student attendance and the duration of a particular summer school program.

The mean total program costs for reading and math received by the students in each CE selection category are shown for each cohort in Table 3-12. (Detailed supporting data are shown in Appendix C, Tables C-1 and C-2). By CE selection category, the mean cost for reading instructional resources ranges from a low of $24 for non-CE students (in cohort 4-5) to a high of $36 for Other-CE students (in cohort 5-6). Title I and Other-CE students have higher reading program resource costs than do non-CE students except in cohort 5-6 where Title I students have the lowest program costs. For math, the range is from a low of $13 for Title I students in cohort 1-2 to a high of $34 for Other-CE students in cohort 4-5. For math, Title I students (except for those in cohort 4-5) have lower mean total program resource costs than do either Other-CE or non-CE students.

As mentioned earlier, school attendance has an impact on the amount of instruction received by the student and thus on the mean program cost. Being absent a day or so in summer school obviously has a more pronounced influence on the program cost than being absent a day or so in the regular year. The average length of the regular-year program was about 180 days.

The average length of summer school is in the 25 to 30 day range, usually for 3 hours a day. As shown in Table 3-13, attendance for students in the different CE selection categories ranges from a low of 75.7 percent to a high of 89.3 percent, for reading, and from 72.9 percent to 89.6 percent for math instruction. Attendance for Other-CE students is always higher than that for Title I students and for non-CE students—except for cohort 1-2. When attendance rates during the school year were examined in Technical Report #5 (Wang, Hoepfner, Zagorski, Hemenway, Brown, and Bear, 1978), the average rates were found to be greater than 90 percent in all grades. The attendance rates shown in Table 3-13 are, therefore, substantially lower than comparable school-year rates.

If the Title I math students in cohort 1-2, whose attendance averges only 72.9 percent, had attended all days in their summer school session, the mean program cost would have been $18 per student rather than the $13 shown. The $18 program cost represents the mean cost of the program *offered* to Title I students in cohort 1-2; the $13 program cost, on the other hand, represents the mean cost of the program *received* by those students. The program cost data from Table 3-12 have been adjusted by the attendance data from Table 3-13 to provide student mean total program costs based on 100 percent attendance. The results, shown in Figures 3-1 and 3-2, change not only the high and low points for the range of program costs but also the standing of the selection categories for particular cohorts.

As shown in Figure 3-1, the range for reading, using the adjusted program cost, is from a low of $29 for non-CE students in cohort 4-5 to a high of $42 for Title I students in cohort 1-2. With the exception of the students in cohort 5-6, Title I and Other-CE students still have higher program costs (i.e., are offered more resources) than non-CE students. For math (Figure 3-2), the range is from a low of $18 for Title I students in cohort 1-2 to a high of $38 for Other-CE students in cohort 4-5. Other-CE and non-CE students have higher cost programs than do Title I students in all cohorts except cohort 4-5. The implication for Title I decisions is especially clear. Although the Title money is there, and the programs are provided, the students are not receiving the full benefit of the resources because of low attendance.

Program cost-per-hour, because it is free of the impacts of attendance and program duration, enables a direct comparison of the intensity of resource-use for different programs. The hourly

Table 3-13

Cohort Attendance by CE Selection Category, by Reading and Math

	Reading		Math	
Selection Category	Attendance Percentage	Number of Students	Attendance Percentage	Number of Students
Cohort 1-2				
Title I	75.7	235	72.9	147
Other-CE	81.8	124	81.3	105
Non-CE	84.7	230	83.2	279
Cohort 2-3				
Title I	77.1	220	83.1	115
Other-CE	84.6	149	83.8	122
Non-CE	82.3	229	81.8	259
Cohort 3-4				
Title I	78.6	230	81.4	159
Other-CE	85.7	126	87.4	101
Non-CE	83.3	169	81.8	168
Cohort 4-5				
Title I	82.4	170	84.2	150
Other-CE	86.5	81	89.6	62
Non-CE	81.7	203	80.3	203
Cohort 5-6				
Title I	81.8	143	83.0	108
Other-CE	89.3	53	87.6	56
Non-CE	78.2	144	81.8	156

costs of instructional materials used in reading and math programs by student CE selection status, and by several student characteristics other than CE selection status, are shown in Table 3-14. (See Tables C-1 and C-2 in Appendix C for supporting detail.)

For reading, on a cost-per-hour basis, the programs of Title I students have a higher cost-per-hour than the programs of the Other-CE and non-CE students, except for cohort 5-6. The math programs of the Other-CE students have a higher cost-per-hour than the programs of either the Title I or the non-CE students. In reading and in math, there are small, but discernible differences between the program hourly costs for students judged by their teachers to be in need of CE services and those not in need. For the two student characteristics of minority status and participation in free-lunch programs, the differences in mean reading program costs-per-hour in most cohorts are small. The differences slightly favor the minority students in all cohorts except 3-4, and participants in the free-lunch program in all cohorts. The differences are even less for math and have the same pattern. Students in the lower two quarters of the spring achievement distribution have reading and math programs with a higher cost-per-hour than do students in the upper two quarters. The allocation effect of students receiving more money if their test scores are lower is in agreement with the results of the cost-effectiveness analysis of the regular-year programs.

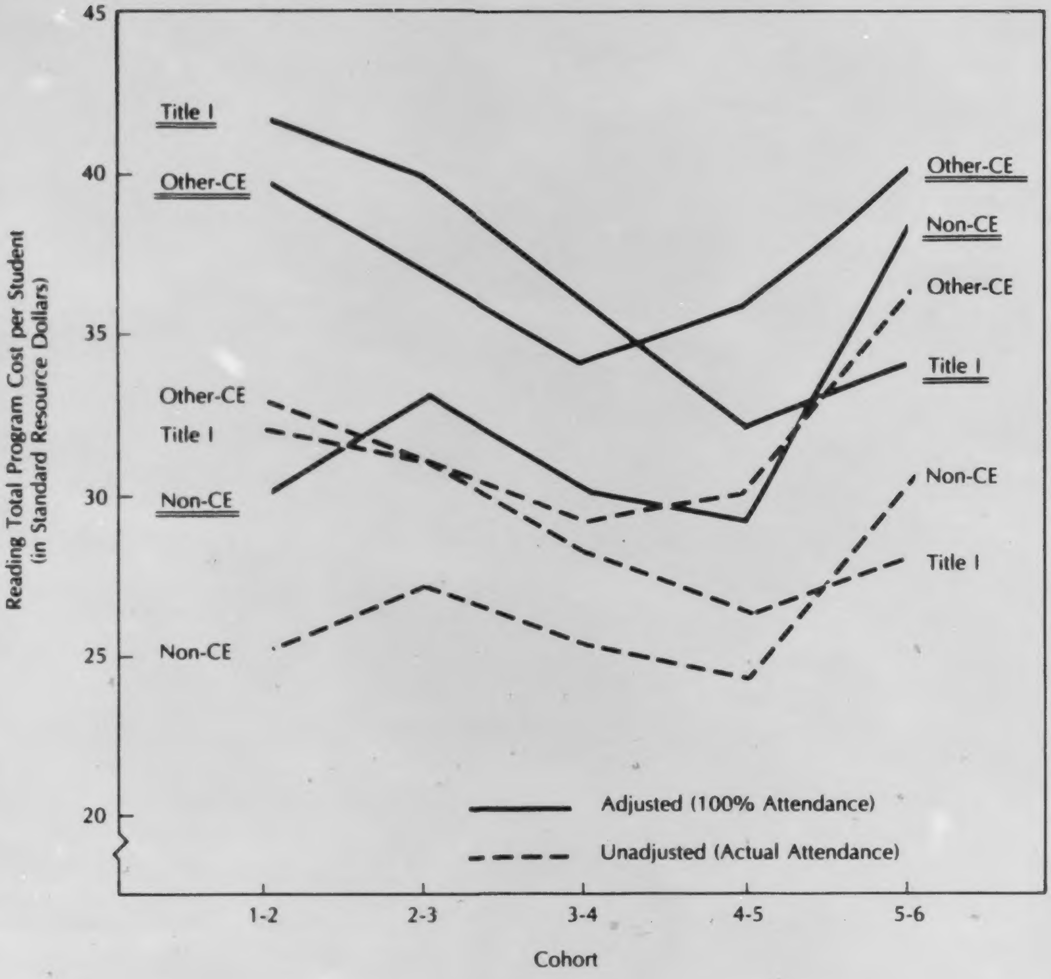

Figure 3-1

Reading Total Program Cost, Unadjusted and Adjusted, for Student Attendance

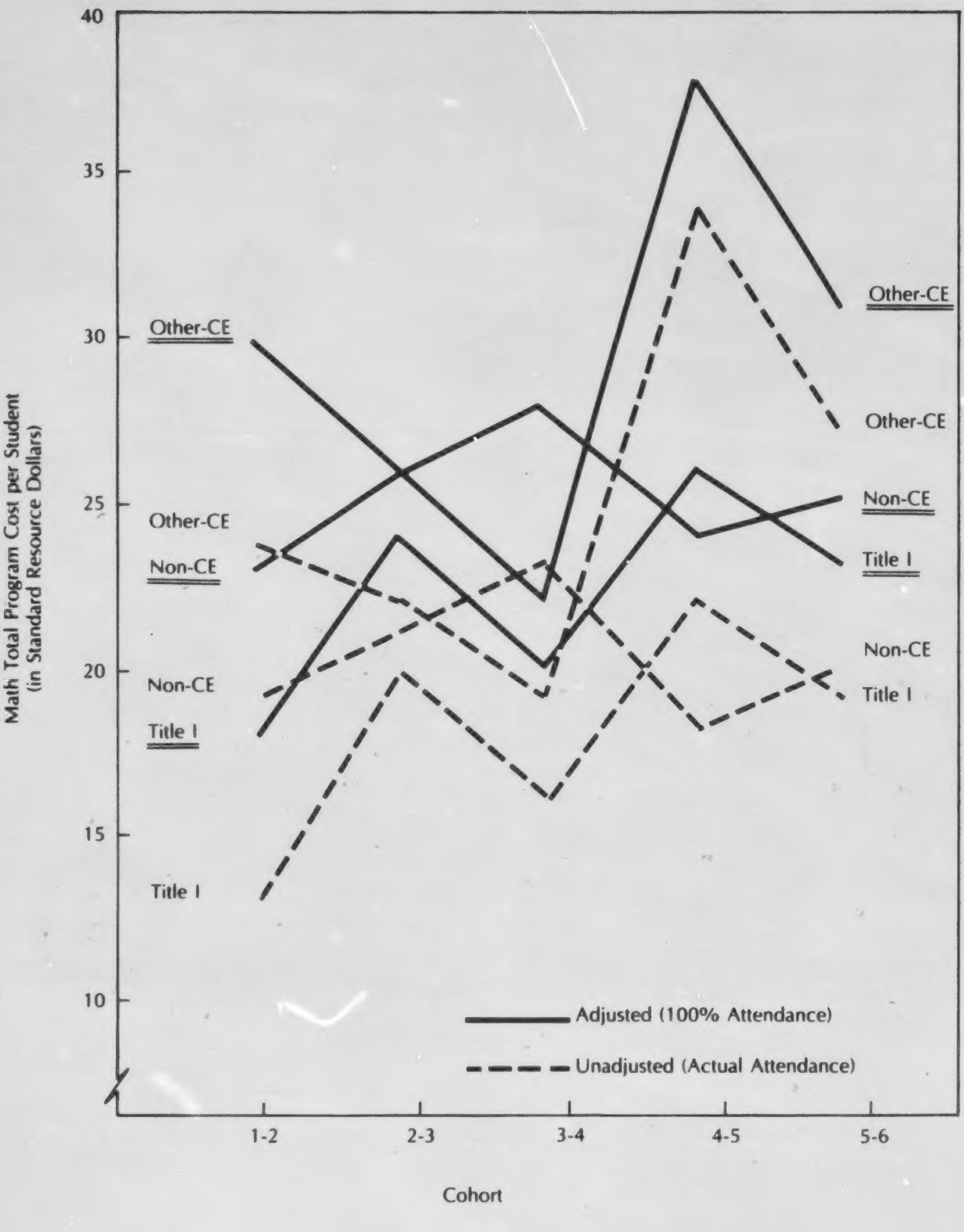

Figure 3-2

Math Total Program Cost, Unadjusted and Adjusted, for Student Attendance

Table 3-14

Summer Program Cost-Per-Hour and Hours of Instruction in Reading and Math, by Selected Student Characteristics (Costs of Instructional Resources Used in Standard Resource Dollars)

Student Characteristics (During Regular School Year)	Cohort 1-2			Cohort 2-3			Cohort 3-4			Cohort 4-5			Cohort 5-6		
	N	Cost/ Hour	Hours	N	Cost/ Hour	Hours	N	Cost/ Hour	Hours	N	Cost/ Hour	Hours	N	Cost/ Hour	Hours
								Reading							
CE Selection Category															
Title I	235	1.92	17	220	1.81	17	230	1.81	15	170	1.65	16	143	1.63	17
Other-CE	124	1.78	18	149	1.58	20	126	1.53	19	81	1.48	21	53	2.13	17
Non-CE	230	1.48	17	229	1.55	18	169	1.60	15	203	1.57	15	144	1.50	20
Teacher Judgment															
CE Needed	330	1.82	18	388	1.69	17	358	1.73	16	289	1.61	17	221	1.69	20
CE Not Needed	250	1.57	16	207	1.57	19	166	1.53	16	164	1.52	15	116	1.54	16
Student Status															
Minority	318	1.76	18	329	1.68	17	325	1.65	15	294	1.60	17	240	1.67	19
Non-Minority	262	1.67	16	266	1.61	19	199	1.69	18	159	1.53	16	97	1.58	17
Free-Lunch Program															
Participant	319	1.70	17	321	1.67	17	329	1.69	16	302	1.64	17	235	1.74	19
Non-Participant	261	1.64	17	274	1.62	19	195	1.62	16	151	1.45	15	102	1.40	17
Spring Achievement															
Lowest Quarter	244	1.84	18	272	1.78	17	262	1.70	16	230	1.62	18	168	1.78	18
2nd Quarter	166	1.73	17	179	1.60	19	133	1.76	17	126	1.64	16	94	1.54	22
3rd Quarter	127	1.57	16	116	1.53	18	74	1.45	16	57	1.32	14	50	1.51	16
Highest Quarter	52	1.48	17	31	1.30	18	56	1.53	14	41	1.37	12	28	1.43	14

Table 3-14 (Continued)

	Math														
CE Selection Category															
Title I	147	1.56	8	115	1.37	14	159	1.44	11	150	1.54	14	108	1.56	12
Other-CE	105	1.62	15	122	1.56	14	101	1.46	13	62	1.87	18	56	1.70	16
Non-CE	279	1.42	13	259	1.31	16	168	1.43	16	203	1.34	14	156	1.48	14
Teacher Judgment															
CE Needed	288	1.56	11	308	1.46	14	292	1.45	13	257	1.55	15	202	1.65	13
CE Not Needed	236	1.42	13	185	1.27	17	136	1.44	14	157	1.43	14	116	1.39	14
Student Status															
Minority	291	1.51	11	274	1.42	15	272	1.40	12	259	1.58	14	215	1.61	13
Non-Minority	233	1.47	13	219	1.33	15	156	1.50	16	155	1.39	16	103	1.46	16
Free-Lunch Program															
Participant	297	1.56	11	273	1.49	14	278	1.42	13	272	1.61	16	216	1.66	13
Non-Participant	227	1.41	13	220	1.25	16	150	1.49	15	142	1.33	14	102	1.36	15
Spring Achievement															
Lowest Quarter	187	1.59	12	191	1.54	14	184	1.50	14	174	1.66	15	131	1.62	13
2nd Quarter	150	1.51	12	144	1.31	16	107	1.42	13	123	1.49	17	93	1.58	14
3rd Quarter	09	1.34	13	93	1.28	16	96	1.41	13	67	1.47	14	56	1.44	13
Highest Quarter	105	1.42	12	68	1.27	16	41	1.30	13	51	1.33	12	40	1.43	14

Averaged over cohorts, the reading program cost-per-hour of instructional resources used is \$1.78 for Title I students, \$1.65 for Other-CE students, and \$1.54 for the non-CE students. The overall average program cost-per-hour figures for math follow a different pattern, with the \$1.61 for Other-CE students as the highest cost-per-hour. The cost-per-hour for Title I students is \$1.50, with \$1.39 for non-CE students.

Instructional Hours

The data on instructional hours provide a basis for assessing the intensity of summer programs that is independent of the particular procedures used to estimate the cost of those programs. The actual hours of instruction received by summer-school students (Table 3-14) indicate rather strongly that there is little variation in the hours of instruction received by the groups of students depicted in the table. More importantly, the total-hour values in both reading and math are rather small. For the various CE categories the hours range from 15 to 21 in reading and 8 to 18 in math.

In comparison to the amounts of instruction received by students during the school year, the hours of summer instruction are quite small. Hemenway et al. (1979), in Technical Report #9 from the SES, report population projections of the average hours of instruction received by students during the school year on a weekly basis. The range reported is 5.3 to 9.1 hours per week in reading and 4.8 to 5.0 hours in math (the ranges are over the grade levels 1 to 6). Given that the typical summer program operates over a five-to-six-week period, even the largest hourly figures shown in Table 3-15 result in substantially less instruction on a weekly basis than is the case for the entire population of students during the school year (about 4 hours for reading and 3 hours for math). Even if the instructional sequences offered in summer school were well-designed and quite effective, the actual amount of time devoted to instruction would probably not be sufficient to support much growth in student achievement.

What Combinations of Instructional Resources (Program Components) Are Used in Summer Programs and How Much Do They Cost?

In the preceding section, the mean total instructional resource costs and costs-per-hour for summer reading and math instruction were discussed; in this section we investigate the different combinations of resources used and their contributions to the total program cost. The combinations of resources are identified as program components. The thirteen program components correspond to the amount of time the student receives instruction from a classroom teacher or a special teacher in groups of four dfferent sizes, and the amount of time spent with a teaching assistant or aide under the direction of the classroom teacher or a special teacher. The last three program components, tutoring by a student or volunteer, working independently with programmed materials, and working independently without programmed materials, cover the remainder of the instructional time.

The mean costs of the programs components, the mean hours of instruction received in each program component, and numbers of students receiving instruction in each of the program components are shown in Table 3-15 for reading and in Table 3-16 for math. The program-component costs for the different group sizes for the classroom teachers and special teachers include the cost of their specified (on the Summer Teacher Questionnaire) use of clerical aides

Table 3-15

Mean Reading Cost and Mean Hours of Reading Instruction by Program Component, CE Selection Status, and Cohort (Costs in Standard Resource Dollars)

Selection Category	Program Component													
	Classroom Teacher Whole Class	Classroom Teacher Large Group	Classroom Teacher Medium Group	Classroom Teacher Small Group	Classroom Teacher Teaching Assistant	Special Teacher Whole Class	Special Teacher Large Group	Special Teacher Medium Group	Special Teacher Small Group	Special Teacher Teaching Assistant	Tutoring-Student Volunteer	Independent, Programmed Materials	Independent, Non-Programmed Materials	Overall Means for Cost and Hours and Total N
Cohort 1-2														
Title I														
Cost	3	4	11	26	5	2	–	8	37	8	1	2	2	32
Hours	3	5	7	8	5	4	–	5	11	7	3	3	4	17
N	86	30	90	148	117	10	3	25	22	23	90	101	199	235
Other CE														
Cost	3	3	9	21	4	2	–	4	9	2	1	1	2	33
Hours	4	3	6	7	4	5	–	4	3	2	2	2	4	18
N	63	51	75	107	85	1	–	7	7	8	52	37	114	124
Non-CE														
Cost	4	8	9	16	4	12	1	14	19	5	1	1	2	25
Hours	5	6	6	5	3	14	1	12	6	5	2	1	4	17
N	77	19	76	106	83	58	20	23	47	27	63	24	217	230
Cohort 2-3														
Title I														
Cost	2	4	9	17	3	2	1	7	24	8	1	2	2	31
Hours	2	4	6	5	3	4	1	5	7	6	1	4	4	17
N	66	14	121	152	132	10	4	45	46	35	64	123	208	220
Other CE														
Cost	4	3	9	20	4	–	–	9	20	2	1	1	3	31
Hours	5	3	6	6	4	–	–	8	6	2	2	2	6	20
N	84	44	108	85	86	–	–	22	21	12	53	61	117	149
Non-CE														
Cost	3	3	9	23	3	11	1	9	14	5	1	1	3	27
Hours	3	3	5	7	3	13	1	8	4	5	2	2	6	18
N	70	39	88	131	83	43	16	18	32	20	65	51	213	229
Cohort 3-4														
Title I														
Cost	3	3	10	18	5	1	2	3	14	5	1	2	2	28
Hours	4	4	6	6	4	2	2	2	4	4	2	3	4	15
N	70	36	94	152	125	12	12	48	48	39	82	97	217	230
Other CE														
Cost	5	2	12	20	5	1	2	7	13	2	1	1	2	28
Hours	7	1	7	6	5	2	2	6	4	2	3	2	4	19
N	79	41	57	68	90	5	5	15	16	12	64	51	118	126
Non-CE														
Cost	4	3	10	26	3	3	1	4	9	5	1	1	2	25
Hours	5	4	6	8	3	4	2	3	3	5	2	2	5	15
N	72	23	53	79	51	29	23	13	37	29	47	36	154	169

Table 3-15 (Continued)

Cohort 4-5														
Title I														
Cost	3	11	11	20	3	2	2	2	8	2	1	1	2	26
Hours	4	9	8	6	2	3	3	2	3	2	1	2	4	16
N	33	22	56	104	73	29	41	32	39	53	80	76	168	170
Other CE														
Cost	6	18	11	19	4	–	–	11	16	2	2	2	4	31
Hours	8	13	7	6	3	–	–	9	5	3	5	3	8	21
N	31	9	20	62	55	–	–	10	10	8	22	21	71	81
Non-CE														
Cost	4	4	10	20	3	3	2	3	9	2	1	1	2	24
Hours	4	4	6	6	2	3	2	3	3	3	2	1	5	15
N	92	49	62	118	91	23	24	15	31	29	73	60	194	203
Cohort 5-6														
Title I														
Cost	2	17	14	21	4	1	2	1	6	1	1	1	2	28
Hours	2	13	9	6	4	2	3	1	2	2	2	2	6	17
N	22	21	50	93	53	26	31	28	31	37	74	62	139	143
Other CE														
Cost	4	9	10	25	8	–	–	10	14	3	1	2	2	36
Hours	5	9	7	8	8	–	–	8	5	4	2	3	4	17
N	11	7	12	45	35	–	–	6	6	6	17	12	47	53
Non-CE														
Cost	2	9	12	21	3	2	3	5	22	3	1	2	3	30
Hours	3	8	8	7	3	3	3	3	6	3	3	4	6	20
N	49	36	55	85	66	11	21	11	20	23	46	80	130	144

and the frequency of use of equipment and materials. Instructional time in all program components occurs during summer school; most students, however, in all cohorts and in all CE selection categories, do not receive instruction in the program components using special teachers.

The major feature of these tables is the variation in the numbers of Title I and non-CE students who receive instruction in the medium-group and small-group program components. Twice as many of both of these categories receive instruction in the smaller groups, as do students in whole-class or large-group instruction. The Other-CE students tend to spend some time in all the various group sizes. These findings are in line with the conventional wisdom that class sizes (and instructional group sizes) in summer school tend to be smaller than in the regular year.

Another finding, not unexpected, is that the number of students who spend time with a student or adult volunteer tutor increases for the higher cohorts. Roughly half the students spend some of their instructional time working independently with programmed learning materials. Consistently, almost all students in all cohorts spend some time working independently with non-programmed materials.

Table 3-16

Mean Math Cost and Mean Hours of Math Instruction by Program Component, CE Selection Status, and Cohort (Costs in Standard Resource Dollars)

Selection Category	Program Component Classroom Teacher Whole Class	Classroom Teacher Large Group	Classroom Teacher Medium Group	Classroom Teacher Small Group	Classroom Teacher Teaching Assistant	Special Teacher Whole Class	Special Teacher Large Group	Special Teacher Medium Group	Special Teacher Small Group	Special Teacher Teaching Assistant	Tutoring-Student Volunteer	Independent, Programmed Materials	Independent, Non-Programmed Materials	Means for Cost and Hours. Total for N
Cohort 1-2														
Title I														
Cost	2	4	6	9	2	–	–	–	19	–	<.5	1	1	13
Hours	3	4	4	3	2	–	–	–	5	–	1	1	2	8
N	62	28	80	82	115	–	–	–	1	–	49	38	118	147
Other-CE														
Cost	3	4	6	16	3	2	–	–	20	7	1	2	2	24
Hours	4	4	4	5	3	2	–	–	6	6	3	3	4	15
N	45	39	53	82	90	1	–	–	1	1	42	27	93	105
Non-CE														
Cost	5	1	4	13	3	2	3	4	20	5	1	1	3	19
Hours	6	1	3	4	3	3	3	4	6	4	3	2	6	13
N	101	22	61	163	76	56	7	48	47	28	104	19	224	279
Cohort 2-3														
Title I														
Cost	2	2	12	10	3	–	–	–	25	3	<.5	1	3	20
Hours	5	2	8	3	3	–	–	–	8	3	1	2	6	14
N	47	19	47	87	62	–	–	–	7	1	56	27	98	115
Other-CE														
Cost	6	5	5	14	5	1	<.5	<.5	21	5	1	1	2	22
Hours	9	5	3	4	6	1	<.5	<.5	7	5	2	2	4	14
N	59	46	50	93	70	3	2	2	3	3	38	11	69	122
Non-CE														
Cost	5	4	7	14	4	2	6	4	18	5	1	2	3	21
Hours	7	3	4	4	4	3	6	4	5	5	3	3	6	16
N	68	55	79	129	99	42	5	40	36	21	130	59	232	259
Cohort 3-4														
Title I														
Cost	3	1	8	9	2	2	–	–	18	6	1	1	2	16
Hours	5	1	6	3	2	2	–	–	5	5	1	1	3	11
N	67	38	78	92	82	12	–	–	13	12	51	41	140	159
Other-CE														
Cost	3	3	3	11	4	12	<.5	<.5	25	7	1	1	2	19
Hours	5	3	2	4	4	17	<.5	<.5	8	7	2	1	5	13
N	76	26	44	75	72	4	1	1	4	4	39	12	86	101
Non-CE														
Cost	4	6	9	15	4	2	5	4	19	4	1	3	3	23
Hours	6	5	6	5	3	2	6	4	6	3	3	6	6	16
N	32	31	75	87	69	5	6	12	31	12	68	40	129	168

Table 3-16 (Continued)

Cohort 4-5														
Title I														
Cost	3	2	5	18	2	10	–	20	22	7	<.5	1	2	22
Hours	6	3	4	6	2	14	–	20	7	7	1	2	2	14
N	77	7	37	92	63	18	–	1	19	18	47	43	127	150
Other-CE														
Cost	3	1	1	26	6	8	2	2	17	5	1	1	2	34
Hours	5	1	1	8	6	11	2	2	6	5	3	2	4	18
N	54	22	1	54	33	4	3	3	6	5	32	24	43	62
Non-CE														
Cost	2	3	4	14	4	6	5	9	11	2	1	3	3	19
Hours	3	3	3	4	3	9	5	9	3	2	3	4	7	14
N	91	16	73	113	102	16	10	14	32	19	79	28	165	203
Cohort 5-6														
Title I														
Cost	2	2	4	11	3	17	–	20	28	7	<.5	1	2	19
Hours	4	3	3	3	3	23	–	21	9	8	1	2	3	12
N	49	41	46	83	65	5	–	1	7	5	44	36	87	108
Other-CE														
Cost	3	2	7	15	6	17	6	7	17	5	1	2	2	27
Hours	4	2	5	5	5	24	7	8	5	6	2	3	4	16
N	38	17	23	50	37	1	1	2	3	2	25	18	53	56
Non-CE														
Cost	3	3	4	13	4	4	2	9	26	4	1	5	3	20
Hours	4	3	3	4	4	6	3	9	8	5	2	9	6	14
N	84	27	39	103	83	4	5	11	12	7	46	31	97	156

An examination of the mean costs for the program components reveals no surprises. As the instructional group size decreases, the mean cost of the program component increases. The cost-per-hour for the classroom, and special teacher components, includes the cost of each teacher's use of clerical aides and the cost of each teacher's stated use of equipment and materials. The cost-per-hour for each program component, shown in Table 3-17, highlights the impact of instructional group size and in the teacher's use of other resources. Special teachers reported that they used clerical aides less frequently than classroom teachers; special teachers also recorded that they used less equipment and fewer materials in providing instruction.

SUMMARY

In this chapter, which is largely descriptive, it was found that summer schools are available to students in 51 percent of schools having grades in the 1 to 6 range. Little relationship exists between the availability of summer school and the concentration of low-achieving students in schools. Additional information on the availability of summer school was discussed.

Generally, students who attended summer school in our sample have lower achievement scores, in both reading and math, than those students who did not attend summer school (however, not all students, obviously, had summer programs available to them). CE students were found to be much more likely to attend summer school than non-CE students. Similarly,

Table 3-17

The Cost-Per-hour of the Program Components Used in Summer School Programs

Program Components	Cost-Per-Hour	
	Reading	Math
Classroom Teacher Provides Instruction for the whole class (21 or more students)	$0.85	$0.80
Classroom Teacher Provides Instruction to a Large Group (14-20 students)	1.15	1.15
Classroom Teacher Provides Instruction to a Medium Group (7-13 students)	1.55	1.55
Classroom Teacher Provides Instruction to a Small Group (2-6 students)	3.25	3.25
Teaching Assistant/Aide Working Under the Direction of the Classroom Teacher	1.10	1.10
Special Teacher Provides Instruction for the Whole Class (21 or more students)	0.85	0.70
Special Teacher Provides Instruction to a Large Group (14-20 students)	1.00	0.90
Special Teacher Provides Instruction to a Medium Group (7-13 students)	1.30	1.05
Special Teacher Provides Instruction to a Small Group (2-6 students)	3.30	3.25
Teaching Assistant/Aide Working Under the Direction of the Special Teacher	0.95	1.05
Tutoring by Another Student or by a Volunteer	0.40	0.40
Independent Study Using Programmed Materials	0.55	0.55
Independent Study Using Non-programmed Materials	0.45	0.45

students who need CE services (as judged by their teachers), minority students, and students who participate in free-lunch programs were all more likely to attend summer school than their counterparts. Most of the summer programs in our sample offer remedial instruction.

The results indicate that, whether assessed on the basis of hours of instruction received by students or in terms of the cost of instructional resources used, summer programs are not academically intensive. The average cost per pupil of reading programs for the summer is in the $24 to $36 range; the average for math programs is $13 to $34. Even when the costs are adjusted to a basis of perfect attendance by students, the resulting program costs are not high, ($29 to $42 in reading and $18 to $38 in math). For all categories, the instructional hours-received range from 15 to 21 in reading and from 8 to 18 in math. Given that the rates of attendance are substantially lower in summer school than in school-year programs, and given the small absolute amounts of instruction that take place, summer programs can hardly be expected to carry a large educational burden.

Viewed on the basis of costs-per-hour, the differences among the groups of students are not large. However, the differences that do exist tend to favor students who were CE selectees in the previous school year, as well as students in the lower two quarters of the achievement distribution.

The analysis of the program component costs, our vehicle for investigating the combination of resources used in summer programs, indicates that class and instructional group sizes are typically in the small and medium range. This result suggests that summer programs have some intensive elements about them; however, a corresponding result, namely that rather little instruction by special teachers takes place, argues against the conclusion that summer programs are intensive treatments.

CHAPTER 4. ACHIEVEMENT GROWTH DURING THE SUMMER AND THE EFFECTIVENESS OF SUMMER SCHOOL

In this chapter we address questions of whether students, especially CE students, maintain their school-year gains over the summer months, and general questions on the effectiveness of summer school. Four policy questions related to these issues are discussed. Although our approach is to concentrate on the specific policy questions at hand (see Chapter 1) and to present those analyses that we believe to be most pertinent to those questions, we also report the results of supplemental analyses that address some specific hypotheses about differential growth in achievement over the summer on the part of CE students.

Because of the longitudinal nature of our design, only students for whom data on all three of the relevant test occasions (Fall, 1976; Spring and Fall, 1977) are available are included in the analyses. The sample, therefore, was reduced to about 39,300 students for reading and math, of whom about 5,600 attended summer school in 1977. (A number of analyses were also performed on the data of what may be termed a "semi-longitudinal" sample consisting of all students who were present at one or both of the 1976-77 test occasions. The results based on the semi-longitudinal sample were extremely similar to those presented below based on the fully longitudinal sample. A selection of the results based on the semi-longitudinal sample is given in Appendix D.) The pool of approximately 5,600 summer-school attendees, and 33,700 non-attendees, provides the data to assess the effects of attending summer school on subsequent achievement.

Do Students Maintain Their Achievement Growth Over the Summer Months?

This first question is the more general of two policy questions that bear on the existence of a decline in test scores on the part of CE students over the summer. Table 4-1 presents longitudinal achievement data for five cohorts of students. Seven to eight thousand students are represented in each cohort. As can be seen, for students in general, an absolute drop-off in mean achievement score is not common. For reading, none of the cohorts exhibits a Fall 1977 average test score lower than that obtained during the preceding spring. In math, one drop-off of four points in the average test score occurs in cohort 4-5. Because the data in Table 4-1 are based on very large and fully longitudinal samples of students, the existence of an absolute decline in test scores seems unlikely. Rather, the case appears to be one of small increases in student achievement over the summer.

As mentioned in Chapter 1, some instruction takes place between the two test administrations that bracket the summer (i.e., the test administrations do not coincide exactly with the ending and beginning of the school year), and the small increases over the summer may be attributable to both schooling-growth and to growth over the summer in the absence of schooling. However, the comparison among various groups of students should remain unaffected by this situation because all students experienced the schooling. In fact, the data descriptive of growth over the summer are of only limited usefulness, other than as establishing a frame of reference for the comparisons among the groups of students that are the subject of the next policy question.

Table 4-1

Reading and Math Test Scores (VSS) for Five Longitudinal Cohorts Over Three Test Administrations

Cohort	N	Test Administration					
		Fall, 1976		Spring, 1977		Fall, 1977	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Reading							
1-2	8,412	343	33	408	45	417	49
2-3	7,769	413	49	456	52	463	55
3-4	7,744	457	54	491	55	499	63
4-5	7,555	488	62	519	63	526	67
5-6	7,133	520	64	547	69	556	73
Math							
1-2	8,412	330	35	392	45	396	45
2-3	7,763	391	45	446	51	447	50
3-4	7,699	441	49	498	54	499	59
4-5	7,556	491	59	543	64	539	64
5-6	7,247	539	64	583	72	584	72

Is Achievement Growth Over the Summer Different for Various Groups of Students?

SUMMER GROWTH AND RECEIPT OF CE

The nub of the summer drop-off question involves differential out-of-school learning rates for CE students. Table 4-2 displays the data for the analysis of this question. Mean reading and math scores (expressed both as vertical scale scores and percentile scores) are presented for CE and non-CE students.

In reading, no instance of a test-score decline over the summer occurs for the VSS or the percentile data in Table 4-2. On the contrary, both CE and non-CE students exhibit small increases in their fall test scores. For math, two small decines (of one scale-score point each) are shown by CE students (cohorts 3-4 and 4-5), and non-CE students have a lower fall score (5 points) in cohort 4-5. In reading, the non-CE students, typically, exhibit more growth between the two test administrations, although the differences are not large. The differences favoring non-CE students are less evident in the math results.

The data of Table 4-2 indicate that neither CE nor non-CE students typically show summer 'drop-off' in terms of vertical-scale scores or percentile scores. (Percentile conversions were developed separately for fall and spring, based on nationally projected distributions.) Al-

Table 4-2

Mean Reading and Math Test Scores (VSS and Percentile) at Three Times for Five Cohorts of CE and Non-CE Students

CE Status	N	Test Administration Fall, 1976		Spring, 1977		Fall, 1977		Spring-to-Fall Differences	
		VSS	Percentile	VSS	Percentile	VSS	Percentile	VSS	Percentile
Reading									
Cohort 1-2									
CE	2281	326	32	385	31	391	36	6	5
Non-CE	6131	349	51	416	52	427	55	11	3
Cohort 2-3									
CE	2320	384	27	428	29	433	32	5	3
Non-CE	5449	425	53	468	52	476	56	8	4
Cohort 3-4									
CE	2344	429	25	455	27	456	29	1	2
Non-CE	5400	474	54	507	54	518	59	11	5
Cohort 4-5									
CE	1918	443	23	474	24	477	26	3	2
Non-CE	5637	504	52	534	52	543	55	9	3
Cohort 5-6									
CE	1477	472	24	497	24	501	25	4	1
Non-CE	5656	533	51	561	51	571	54	10	3
Math									
Cohort 1-2									
CE	1351	314	34	376	37	377	39	1	2
Non-CE	7061	333	49	395	50	400	54	5	4
Cohort 2-3									
CE	1327	368	31	421	32	426	37	5	5
Non-CE	6436	396	49	451	49	451	52	0	3
Cohort 3-4									
CE	1499	414	30	469	34	468	35	–1	1
Non-CE	6200	448	50	505	50	506	53	1	3
Cohort 4-5									
CE	1293	452	28	502	38	501	30	–1	2
Non-CE	6263	499	50	552	50	547	50	–5	0
Cohort 5-6									
CE	1115	497	28	539	29	543	32	4	3
Non-CE	6132	546	50	591	50	592	53	1	3

though, in a strict sense, percentile ranks ought not to be treated as scores that can be averaged, doing so seems to have only slight effects and provides a representation of the results that have intrinsic meaning, unlike the vertical-scale scores. Hence, we present these percentile results as a mechanism for clarifying the results obtained from the analysis of the scale scores.

No occurrence of a loss over the summer is to be found in Table 4-2 for percentile ranks. Both CE and non-CE students maintain their percentiles over the summer, or increase them by small amounts. The CE students gain less over all cohorts in reading than do non-CE students (2.6 and 3.8 percentiles, respectively) but their gains in math, again averaged over all cohorts, are equal to those of non-CE students (2.6 percentiles). The differences in achievement over the summer between CE and non-CE students, although quite small, are consistent in direction with what some researchers have called "relative summer loss" on the part of CE students.

Summer Growth for Title I

Although we have phrased the principal concern with the summer-loss question in terms of differential growth rates for CE students, further differentiation within the CE group is of interest. Specifically, a separate examination of summer growth among Title I students is in order, as are separate examinations of the changes in test scores shown by students at various levels of pre-summer achievement status. Further, the performance of students subset on the basis of their participation in free or reduced-price meals programs and on their minority/majority status are of interest. Tables displaying the mean test scores for these additional partitions of the sample follow.

Vertical-scale and percentile scores for each of the three test occasions are shown for five longitudinal cohorts of Title I students in Table 4-3. Both the vertical-scale and the percentile results indicate that, in reading, these students maintain their school-year achievement over the summer. The summer gains are generally small, averaging 2.8 VSS points and 2.2 percentile ranks. In math, three of the five cohorts exhibit small declines in their mean vertical-scale scores (averaging 2.7 points over the three cohorts); the other two cohorts (2-3 and 5-6) average a 3.5 point increase in mean VSS over the summer. None of the cohorts exhibits an absolute decline in its average standing relative to the population as indicated by the percentile values in Table 4-3.

Comparing the data on Title I students (in Table 4-3) to those of the general population of non-CE students in Table 4-2, we note that the pattern of growth over the summer is quite similar. The increases in reading are substantially lower in terms of VSS units; somewhat less so when viewed on the basis of percentiles. The gains are roughly more comparable in the math data where there are three instances of small declines in VSS scores; neither the non-CE students in Table 4-2 nor the Title I children exhibit losses in their percentile ranks.

As was the case in the comparison between CE and non-CE students, the notion of some degree of relative loss in achievement over the summer finds some slight support in these data on Title I students. However, the differences are certainly not of a strikingly large magnitude; and in math, where the continuation of positive growth is more doubtful, the summer changes are quite similar.

Summer Growth and Achievement Status

The pattern of change in achievement over the summer in relation to achievement status is illustrated in Table 4-4. Each student in the longitudinal sample was categorized into one of four levels of achievement status, based on the average percentile ranks earned in 1976-77. The categorization was based on the average percentile in order to increase the stability of the status measure (and thereby reduce the size of expected regression effects). Not surpris-

Table 4-3

Mean Reading and Math Test Scores (VSS and Percentile) for Five Cohorts of Title I Students Over Three Test Administrations

		Test Administration						Spring-to-Fall Differences	
Cohort	N	Fall, 1976		Spring, 1977		Fall, 1977			
		VSS	Percentile	VSS	Percentile	VSS	Percentile	VSS	Percentile
					Reading				
1-2	1,583	323	29	383	30	387	34	4	4
2-3	1,606	379	24	424	27	427	29	3	2
3-4	1,646	414	22	451	25	451	27	0	2
4-5	1,303	438	21	470	22	471	24	1	2
5-6	1,066	464	21	488	21	494	21	6	1
					Math				
1-2	854	310	31	373	35	372	35	–1	0
2-3	864	362	27	414	28	419	33	5	5
3-4	1,023	408	26	465	31	462	32	–3	1
4-5	850	445	24	499	26	495	27	–4	1
5-6	758	489	23	532	26	534	26	2	0

ingly, none of the reading cohorts exhibit a decline over the summer. Other than that, no clear pattern emerges in the growth data of students at different levels of achievement status. The incidence of losses over the summer in math achievement tend to be concentrated among students at the higher levels of the distribution, where regression effects could be summoned as an explanation. Clearly, we can conclude that, at the level of individual students, the low-achieving student is *not* more likely to lose his/her achievement level.

Summer Growth, Economic Status and Race/Ethnicity

The test-score data in relation to student economic status are provided in Table 4-5. The indicator of economic status is participation in a free- or reduced-price meals program during the regular school year. Students who participate in such programs are generally of lower economic status than those who do not. In all cohorts in reading, the gains of the non-participating group equal or exceed those of the participating group. The differences are not large in either vertical-scale or percentile terms. In math, the non-participating students do not quite as clearly outgrow the participating children. The gains of the higher economic-status group are smaller in vertical-scale terms in cohorts 1-2 and 2-3 but their loss is larger in cohort 4-5. They exhibit a trivial loss in cohort 5-6, while the participating children show a small (5-point) increase. Again, no declines are evident in percentile rankings in either reading or math. Clearly, the more important differences reside in the comparison of reading to math gains, about which more is said later in this chapter.

Table 4-4

Mean Reading and Math Test Scores (VSS) Cohorts Over Three Test Administrations by Quarter of 1976-77 Achievement Status

Cohort	Achievement Status	N	Test Administration: Fall 1976	Spring 1977	Fall 1977	Spring-to-Fall Difference
			Reading			
1-2	Lowest	2,170	305	357	367	10
	Second	2,483	334	397	404	7
	Third	2,178	358	427	439	12
	Highest	1,581	386	466	475	9
2-3	Lowest	2,289	359	398	406	8
	Second	2,099	403	445	452	7
	Third	1,868	435	482	491	9
	Highest	1,513	479	526	531	5
3-4	Lowest	2,232	396	429	432	3
	Second	2,090	445	480	486	6
	Third	1,913	485	57	528	11
	Highest	1,509	530	565	583	18
4-5	Lowest	2,254	419	449	454	5
	Second	2,037	478	507	513	6
	Third	1,802	515	549	556	7
	Highest	1,462	575	607	618	11
5-6	Lowest	2,092	447	469	477	8
	Second	1,974	508	535	542	7
	Third	1,601	550	578	588	10
	Highest	1,466	608	643	654	11
			Math			
1-2	Lowest	2,070	289	340	353	13
	Second	2,469	320	380	384	4
	Third	2,269	345	411	413	2
	Highest	1,604	375	450	447	–3
2-3	Lowest	2,046	341	387	397	10
	Second	2,250	380	436	436	0
	Third	2,005	411	470	467	–3
	Highest	1,462	451	511	505	–6
3-4	Lowest	1,900	384	434	436	2
	Second	2,238	430	485	483	–2
	Third	2,076	462	523	523	0
	Highest	1,485	505	566	569	3
4-5	Lowest	2,037	423	468	472	4
	Second	2,145	479	529	525	–4
	Third	1,920	516	576	567	–9
	Highest	1,454	573	626	618	–8
5-6	Lowest	1,899	462	497	508	11
	Second	2,014	522	567	567	0
	Third	1,849	569	614	613	–1
	Highest	1,485	622	676	671	–5

Table 4-5

Mean Reading and Math Test Score (VSS and Percentile) for Five Cohorts Over Three Test Administrations, by Student Participation in Free or Reduced-Price Meal Programs

Cohort	Participation Status	N	Test Administration						Spring-to-Fall Difference	
			Fall, 1976		Spring, 1977		Fall, 1977			
			VSS	Percentile	VSS	Percentile	VSS	Percentile	VSS	Percentile
	Reading									
1-2	Participant	3,233	331	36	396	38	403	39	7	1
	Non-Participant	4,333	355	57	424	57	435	59	11	2
2-3	Participant	3,113	392	33	433	32	439	36	6	4
	Non-Participant	4,218	429	55	475	55	483	59	8	4
3-4	Participant	3,445	433	32	467	33	471	36	4	3
	Non-Participant	4,227	478	56	511	56	523	61	12	5
4-5	Participant	3,325	458	30	489	31	493	33	4	2
	Non-Participant	4,157	513	56	544	57	553	60	9	3
5-6	Participant	3,098	489	31	513	31	519	33	6	2
	Non-Participant	3,975	545	56	575	57	586	61	11	4
	Math									
1-2	Participant	3,231	320	39	382	41	387	43	5	2
	Non-Participant	4,344	341	56	406	56	408	58	2	2
2-3	Participant	3,096	376	36	430	37	431	40	1	3
	Non-Participant	4,231	403	54	459	53	459	57	0	4
3-4	Participant	3,421	425	36	479	39	479	49	0	1
	Non-Participant	4,202	455	54	514	54	515	58	1	4
4-5	Participant	3,322	468	35	520	35	518	37	–2	2
	Non-Participant	4,161	510	55	563	55	557	55	–6	0
5-6	Participant	3,116	515	35	554	36	559	39	5	3
	Non-Participant	4,071	557	55	605	56	604	58	–1	2

As the final bivariate look at growth over the summer, we present achievement means for majority and minority students. The data, shown in Table 4-6, are quite similar to those shown on the basis of meal-program participation on the preceding table. Interestingly, in math, the differences all favor minority students who exhibit either larger positive gains or smaller losses in each cohort. Again, maintenance or extensions of growth are more problematical in the math area than in reading.

Regular Year Achievement Gains and Summer Loss

Because of the policy import of results reported by the SRI Educational Policy Research Center,[*] we also tested various hypotheses regarding the summer growth of disadvantaged students relative to their regular year achievement gains. Because the research indicating the existence of summer losses by disadvantaged students was based on data aggregated to what, for the lack of a better term, can be called CE "projects," it was necessary to alter the structure of our data base by aggregating the data to a "project" or school level. For the purpose of these analyses, we defined each Title I project as being comprised of all students in any grade at each school who were selected to receive Title I services. These projects were defined separately for reading and for math. Within our definition, a school could have as many as twelve projects (six in reading and six in math). For the analyses on cohorts—where the definition of "project" is expanded to include all students in that cohort who were selected for Title I—ten projects represent the upper limit.

Although this definition may be at odds with the popular image of a project as a well-defined, homogeneous unit functioning within a school (or even across a number of schools within a district), the definition enables analyses of the summer-loss issue that would otherwise not be feasible within the data base of the SES. Moreover, the popular vision of a CE or Title I project is known to be something of an idealization rather than a generally veridical picture (see Poynor, 1977).

The restructuring of the data base was directed toward one particular hypothesis, namely, that students in especially successful CE programs are more likely to fail to maintain their achievement gains over the summer. This is an extension made by Thomas (1978) of the conclusions drawn by Pelavin and David (1977) that " . . . students who gain a lot over the school year tend to lose a lot over the summer and, conversely those who gain little over the school-year lose little over the summer" (p. 51).

In addition to testing the "project" level verson of the hypothesis, we also extended the analyses to an examination of the summer-loss issue in relation to levels of school-year gains made by individual students (i.e., not subset by projects). The results were very similar to those based on project gains and are given separately for Title I Summer-School Attendees and non-Attendees in Table D-12 in the Appendix. Similar analyses for six other groups of students —based on CE-selection categories—are given in Tables D-13 and D-14.

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[*] Evidence of the keen interest of policy makers in the specific issue of summer growth is highlighted by former HEW Secretary Califano's decision to make the issue (and its implications for Title I) one of the priority issues for department-wide (DHEW) evaluation efforts.

Table 4-6

Mean Reading and Math Test Scores (VSS and Percentile) for Five Cohorts ver Three Test Administrations, by Student Race/Ethnicity

Cohort	Race/Ethnicity	N	Test Administration: Fall, 1976 VSS	Fall, 1976 Percentile	Spring, 1977 VSS	Spring, 1977 Percentile	Fall, 1977 VSS	Fall, 1977 Percentile	Spring-to-Fall Difference VSS	Spring-to-Fall Difference Percentile
Reading										
1-2	Minority	3,080	331	36	399	40	406	41	7	1
	Majority	4,486	355	56	421	55	432	57	11	2
2-3	Minority	2,947	395	35	435	33	439	36	4	3
	Majority	4,384	426	53	473	54	481	58	8	4
3-4	Minority	3,153	433	32	467	33	471	36	4	3
	Majority	4,519	475	54	509	55	520	59	11	4
4-5	Minority	3,146	457	30	488	31	493	33	5	2
	Majority	4,336	511	56	542	56	550	59	8	3
5-6	Minority	3,033	490	31	513	31	521	33	8	2
	Majority	4,040	543	56	573	56	583	60	10	4
Math										
1-2	Minority	3,088	319	38	382	41	387	43	5	2
	Majority	4,487	341	56	405	56	409	58	4	2
2-3	Minority	2,933	375	35	429	36	431	40	2	4
	Majority	4,394	403	54	549	53	458	56	–1	3
3-4	Minority	3,143	425	36	478	38	479	40	1	2
	Majority	4,480	453	53	513	54	513	56	0	2
4-5	Minority	3,170	467	34	519	34	518	37	–1	3
	Majority	4,313	510	55	562	55	556	54	–6	–1
5-6	Minority	3,046	515	35	554	36	561	40	7	4
	Majority	4,141	556	54	604	55	602	57	–2	2

The results of the analysis in which the data were grouped on the basis of project performance during the preceding school year are shown in Table 4-7. These results ought to be somewhat less subject to regression artifacts than those based on individual students because the gains in both the school year and over the summer are more reliably estimated by groups rather than by individuals. In order to further control any regression artifacts, we analyzed data only from those "projects" having at least ten students.

Table 4-7

Mean Spring-to-Fall Test Score (VSS) Changes by Four Levels of Title I Project Gains (School-Year) for Five Cohorts of Title I Students

Cohort	Quarter of "Project" School-Year Gains							
	Lowest		Second		Third		Highest	
	Reading							
	N	Change	N	Change	N	Change	N	Change
1-2	348	11.85	260	5.77	340	1.61	481	–0.45
2-3	292	7.98	428	1.25	233	9.85	432	–2.47
3-4	325	8.57	441	1.55	335	0.40	340	–8.96
4-5	331	4.33	210	6.89	219	2.41	349	–6.90
5-6	215	8.06	255	7.15	201	3.53	222	1.54
	Math							
	N	Change	N	Change	N	Change	N	Change
1-2	90	8.52	215	0.39	224	–1.54	215	–8.93
2-3	191	16.99	238	13.12	112	–5.34	218	–8.86
3-4	291	–4.09	307	–1.12	149	1.36	182	–10.74
4-5	107	0.79	207	2.25	270	–8.60	141	–8.45
5-6	201	12.43	136	10.60	123	0.39	164	–6.63

The results of the analysis of Title I projects are generally similar to those obtained on students classified according to their school-year gains. These values are less extreme than those based on the ungrouped data, indicating that these results probably do reflect fewer of the influences of regression artifacts. All cohorts but one (5-6 in reading), in both reading and math, exhibit average declines over the summer in the highest quarter. All but one cohort (3-4 in math) show gains in the lowest quarter. Inasmuch as the data of Table 4-7 tend to confirm the negative relationship between summer (spring-to-fall) changes and those in the previous school year (fall-to-spring), there is some indication that the incremental gains attained by students in relatively successful Title I programs are, indeed, not maintained over the spring-to-fall time period. However, given the opposite results for students in less successful projects, the educational or psychological dynamics underlying the findings are unclear. Nearly any speculation advanced to account for the failure of gains to be maintained by students at the more successful sites are effectively countered by the quite opposite behavior exhibited by children at the less successful sites. For example, it could, we presume, be possible that teachers at the successful sites were somehow coaching directly to the content of the tests (an admittedly unlikely case) and that, therefore, the large gains are illusory and subject to be lost during the summer vacation. That hypothesis or explanation would require the further assumption that teachers at the less successful sites were not coaching in that fashion. In that event, it would still be difficult to explain the substantial gains by those students. It appears, therefore, that the data grouped on the "project" basis must be reflecting regression at each end of the distribution. Thus it appears that the supposed summer loss of students in high gaining projects is an artifact of regression and does not reflect a phenomenon requiring special educational efforts.

To summarize, the results of the analyses directed at the question of possible differential growth over the summer by various groups of students are reasonably consistent. Beginning with the comparison of CE and non-CE students, and continuing to a separate examination of Title I students, as well as students classified according to their achievement status in the preceding school year, their participation in nutrition programs (a proxy for family economic status) and the comparison of minority and majority students, our analyses indicate that the summer-loss postulated by other researchers is not as prevalent a phenomenon as policy-makers had feared. The data strongly contraindicate the existence of absolute declines. The data further indicate that disadvantaged students tend to grow at a slightly slower rate over the summer than do their non-disadvantaged peers. The special analysis of Title I projects at various levels of school-year also confirm these results.

Up to this point we have presented simple bivariate descriptions of the data bearing on summer growth for various groups of students, by selecting student groups, one at a time, and inspecting the mean growth scores. We will, however, obtain a more comprehensive picture later in this chapter when we consider, all at once, the characteristics on which the groups were formed in multivariate analyses.

Is Summer School Effective in Promoting Achievement Growth?

The previous analyses, as indicated, have not provided support for the proposition that Title I (or CE students in general) suffer severe losses in their achievement level over the summer. The analyses did, however, indicate that, to some extent, continued growth in the absence of schooling is slightly lower for CE students. Clearly, however, a central policy issue involves the effectiveness of summer programs. Even were the data presented under the preceding question totally devoid of any indication of failure to maintain pace with their classmates, the question of the worth of summer school would remain of interest.

The present question addresses the degree to which growth in achievement is associated with attending summer school. The approach to the analysis of this issue is similar to that used under the preceding question. We begin the analysis with rather simple displays of the test score data for various subsets of the sample that are relevant to policy. Following those presentations we present the results of multiple regression analysis designed to test statistically the effects associated with student attendance at summer school.

The basic achievement data descriptive of the difference between attendees and non-attendees were given previously in Chapter 3 (Table 3-7). Figures 4-1 and 4-2 present those same data graphically, for reading and math achievement, respectively. Clearly, the samples of attendees and non-attendees are non-equivalent in terms of their pre-summer achievement in both reading and math. Table 4-8 illustrates these initial differences by providing the

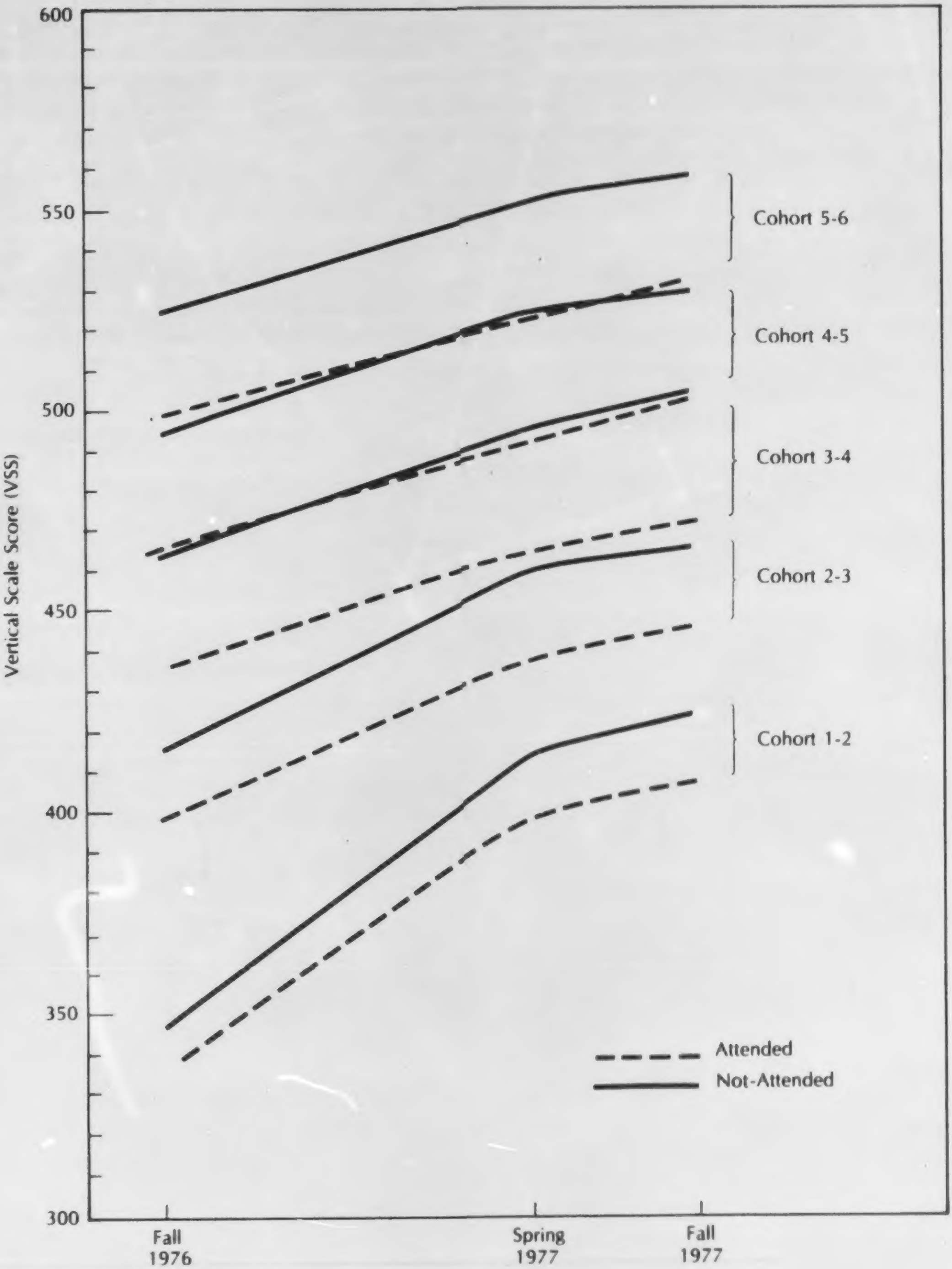

Figure 4-1

Reading Achievement by Summer School Attendance

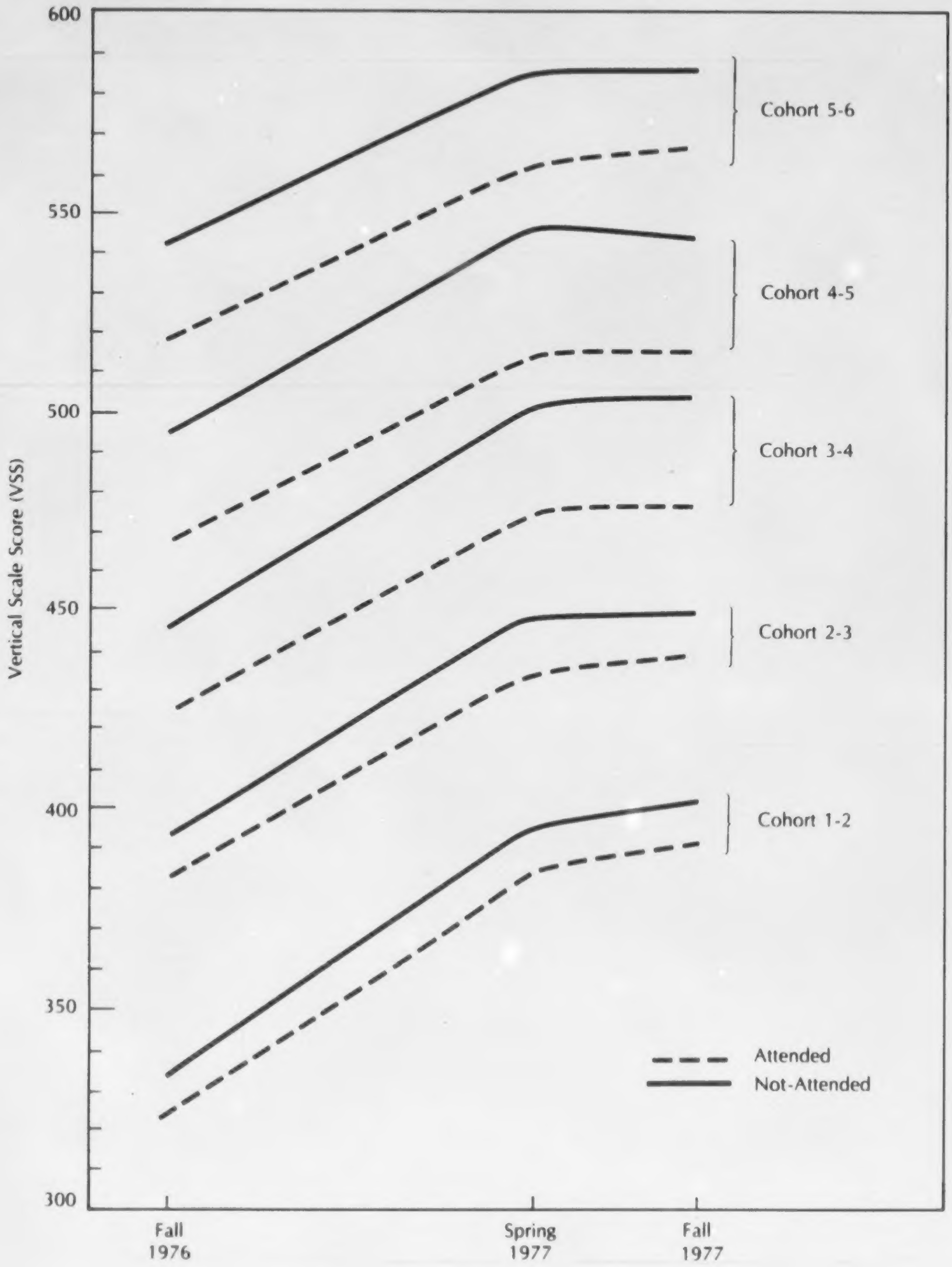

Figure 4-2

Math Achievement by Summer School Attendance

average percentile rank on the three test occasions for each cohort of students. If we average the values shown in Table 4-8 over all cohorts, there is a substantial difference of about 11 percentiles in reading and 10 percentiles in math between attendees and non-attendees in the fall of 1976; in the spring of 1977 the differences are on the order of 12 percentile ranks in reading and 10 percentile ranks in math. The changes over the summer are, however, quite similar for the two groups.

Table 4-8

Mean Percentile Ranks by Summer School Attendance for Five Cohorts Over Three Test Administrations

Cohort Attendance	N	Fall, 1976	Spring, 1977	Fall, 1977	Spring to Fall
		Reading			
Cohort 1-2					
Attended	1054	41	41	43	2
Not Attended	6515	49	50	52	2
Cohort 2-3					
Attended	1172	37	36	40	4
Not Attended	6163	46	47	51	4
Cohort 3-4					
Attended	1388	33	33	36	3
Not Attended	6295	48	49	53	4
Cohort 4-5					
Attended	1092	33	34	37	3
Not Attended	6408	47	47	50	3
Cohort 5-6					
Attended	914	36	35	39	4
Not Attended	6166	47	47	50	3
		Math			
Cohort 1-2					
Attended	1060	42	43	45	2
Not Attended	6518	50	51	53	2
Cohort 2-3					
Attended	1164	40	39	44	5
Not Attended	6167	48	48	51	3
Cohort 3-4					
Attended	1389	36	37	38	1
Not Attended	6244	48	50	52	2
Cohort 4-5					
Attended	1074	34	35	37	2
Not Attended	6425	48	48	48	0
Cohort 5-6					
Attended	914	38	39	42	3
Not Attended	6281	48	48	51	3

Summer School and Receipt of CE

Table 4-9 gives a comparison of students attending summer school and those not attending, according to CE-selection status. A two-level categorization of the CE variable is used in conjunction with the verticle-scale scores. No declines in reading scores over the summer are found in Table 4-9 for either attendees or non-attendees at summer school.

Table 4-9

Mean Reading and Math Scores (VSS) for Five Cohorts, by Summer School Attendance, for CE and Non-CE Students

Cohort Attendance	N		Fall, 1976		Spring, 1977		Fall, 1977		Summer Gain	
	CE	Non-CE	CE	Non-CE	CE	Non-CE	CE	Non-CE	CE	Non-CE
Reading										
Cohort 1-2										
Attended	437	617	327	345	383	411	391	423	8	12
Not Attended	1456	5059	329	351	391	420	396	431	5	11
Cohort 2-3										
Attended	550	622	381	416	423	455	428	462	5	7
Not Attended	1633	4530	384	428	429	472	433	480	4	8
Cohort 3-4										
Attended	691	697	410	458	445	488	445	498	0	10
Not Attended	1615	4680	423	476	460	510	461	520	1	11
Cohort 4-5										
Attended	460	632	432	487	463	517	464	527	1	10
Not Attended	1436	4972	446	506	478	537	481	545	3	8
Cohort 5-6										
Attended	314	600	461	518	485	542	489	555	4	13
Not Attended	1145	5021	475	535	501	563	505	572	4	9
Math										
Cohort 1-2										
Attended	298	762	308	331	374	389	378	395	4	6
Not Attended	762	5703	316	336	379	400	380	404	1	4
Cohort 2-3										
Attended	355	809	366	389	416	442	425	444	9	2
Not Attended	829	5338	367	397	420	454	422	453	2	–1
Cohort 3-4										
Attended	493	896	409	433	460	486	459	485	–1	–1
Not Attended	988	5256	417	451	474	508	472	510	–2	2
Cohort 4-5										
Attended	360	714	444	480	493	531	494	430	1	–1
Not Attended	911	5514	455	502	506	555	504	550	–2	–5
Cohort 5-6										
Attended	246	668	485	531	523	576	531	578	6	2
Not Attended	856	5425	500	549	544	593	546	594	2	1

A comparison of summer attendees and non-attendees in reading reveals similar gains in vertical-scale scores. Among CE students, attendees gain an average of 3.6 score points while non-attendees gain an average of 3.4 points. In the non-CE group, summer attendees gain 10.4 vertical-scale points on average with non-attendees gaining 9.4 points on average. These differences are not indicative of a significant effect due to attending summer school.

When the students are subset on the basis of summer-school attendance, seven of the 20 relevant (i.e., attendee vs. non-attendee) comparisons in math exhibit a loss from spring to fall. Four of these declines, which are fairly small in magnitude, occur in the non-CE group. These four declines are split evenly between attendees and non-attendees at summer school.

The three achievement declines in the CE group occur in cohorts 3-4 and 4-5; two of those declines are in the non-attendee subset of CE students.

For math, the differences in average vertical-scale scores between attendees and non-attendees are fairly small. CE attendees tend to exhibit higher gains than do non-attendees in the CE group. There are no significant differences between attendees and non-attendees in the non-CE group.

An inspection of the data in terms of changes in average percentile scores over the summer (Table 4-10) indicates, again, the absence of drop-off in the reading scores for both summer-school attendees and non-attendees and the absence of any meaningful effect of attendance at summer school. The situation is similar in math, with small achievement gains or maintenance being the rule along with the absence of large differences between summer attendees and non-attendees. Across both categories of students (attendees and non-attendees), whether they are CE selectees or non-selectees, the maintenance of gains in math is somewhat more problematic than in reading.

Summer School Effects for Title I Selectees

Turning to a separate examination of the effects of summer school among Title I students, we note that little evidence of effectiveness of summer school is to be found in the data, as shown in Table 4-11. Both the mean vertical-scale scores and percentiles are provided. By and large, the data for Title I students are consistent with those presented above. Six declines, ranging from two to five points, are evident in the vertical-scale scores, but only two declines appear among the averages of the percentile scores. Among the Title I students, the differences between attendees and non-attendees are typically not significant. An exception is the difference of eight points favoring summer attendees in the math data of cohort 2-3.

Previous Year Achievement Gains and Summer School Attendance

In order to address the relation of gains from summer school attendance to the relative success of school-year Title I 'projects', we performed another analysis similar to the 'project' analysis discussed in the preceding section. The results are shown in Table 4-12. As we noted earlier, without reference to the attendance variable, students in 'projects' showing large school-year gains tend to decline over the summer, while those in 'projects' having much smaller school-year gains show fairly substantial increases in achievement during the spring-to-fall period. The same general pattern is found both for summer-school attendees and non-attendees among Title I children. Given this basic pattern of gains made by students in less successful projects and losses by students in more successful projects, there seems to be no differential effectiveness of summer-school programs with the sample partitioned on the basis of 'project' success.

We should note that the basic pattern of spring-to-fall changes of opposite signs at either end of the distribution is violated in the math results of two of the cohorts. Although not leading to a positive judgment about the efficacy of summer programs, the declines in math achievement by both attendees and non-attendees in the lowest quarter of cohort 3-4, and by attendees in the lowest quarter of cohort 4-5, indicate again the existence of differences in reading and math performance from spring to fall.

Table 4-10

Mean Reading and Math Percentile Scores for Five Cohorts, by Summer School Attendance, for CE and Non-CE Students*

Cohort	Fall, 1976		Spring, 1977		Fall, 1977		Summer Gain	
Attendance	CE	Non-CE	CE	Non-CE	CE	Non-CE	CE	Non-CE
Reading								
Cohort 1-2								
Attended	33	48	30	48	32	51	2	3
Not Attended	34	53	35	54	35	56	0	2
Cohort 2-3								
Attended	25	47	27	44	30	49	3	5
Not Attended	28	54	29	54	33	57	4	3
Cohort 3-4								
Attended	20	45	22	43	24	49	2	6
Not Attended	26	55	29	56	31	60	2	4
Cohort 4-5								
Attended	19	44	20	44	21	48	1	4
Not Attended	25	53	26	53	28	56	2	3
Cohort 5-6								
Attended	20	44	20	43	21	48	1	5
Not Attended	25	52	25	52	27	55	2	3
Math								
Cohort 1-2								
Attended	31	47	36	46	37	49	1	3
Not Attended	36	51	39	53	38	55	−1	2
Cohort 2-3								
Attended	30	45	29	44	37	48	8	4
Not Attended	30	50	31	50	35	53	4	3
Cohort 3-4								
Attended	28	41	30	40	31	43	1	3
Not Attended	31	51	36	52	37	55	1	3
Cohort 4-5								
Attended	23	40	24	40	27	42	3	2
Not Attended	29	51	30	51	31	51	1	0
Cohort 5-6								
Attended	23	43	24	44	28	47	4	3
Not Attended	29	51	31	51	34	54	3	3

* Sample sizes are the same as in Table 4-9.

Summer School Effects and Student Needs for CE

The change in student achievement over the summer was also examined in relation to student needs for CE services as judged by their teachers. These data may be found in Table 4-13, but as mean differences rather than mean scores. The reading data show no cohort that declines over the summer. This is true both in the case of students who are judged to need CE services and in the case of those who are judged not to need such services. In math, both

Table 4-11

Mean Reading and Math Test Scores (VSS and Percentile), by Summer School Attendance, for Five Cohorts of Title I Students

Cohort Attendance	N	Fall, 1976		Spring, 1977		Fall, 1977		Summer Gain	
		VSS	Percentile	VSS	Percentile	VSS	Percentile	VSS	Percentile
Reading									
Cohort 1-2									
Attended	324	324	30	379	28	386	29	7	1
Not Attended	1013	326	31	390	34	393	33	3	−1
Cohort 2-3									
Attended	371	376	23	420	25	422	26	2	1
Not Attended	1136	380	25	425	27	428	30	3	3
Cohort 3-4									
Attended	498	405	17	440	19	438	21	−2	2
Not Attended	1132	418	24	456	27	457	29	1	2
Cohort 4-5									
Attended	315	429	17	461	19	459	19	−2	0
Not Attended	972	441	22	473	24	475	25	2	1
Cohort 5-6									
Attended	225	452	16	473	15	480	18	7	3
Not Attended	831	468	22	493	22	498	24	5	2
Math									
Cohort 1-2									
Attended	201	304	28	370	34	372	34	2	0
Not Attended	544	313	34	378	38	375	35	−3	−3
Cohort 2-3									
Attended	229	360	27	409	25	419	33	10	8
Not Attended	560	361	26	414	28	416	32	2	4
Cohort 3-4									
Attended	345	401	23	453	26	450	26	−3	0
Not Attended	664	412	28	472	34	468	35	−4	1
Cohort 4-5									
Attended	241	438	20	489	22	489	25	0	3
Not Attended	593	449	25	503	28	498	28	−5	0
Cohort 5-6									
Attended	173	476	18	511	19	517	23	6	4
Not Attended	578	492	25	538	28	539	30	1	2

non-attendees in need of CE and those not in need of CE exhibit similar declines of 5 and 4 points, respectively, in cohort 4-5, and of 1 point in cohort 2-3. Attendees have a four point decline in cohort 3-4. This is consistent with the analysis of CE and non-CE students discussed earlier.

For reading, there is no clear difference favoring either attendees or non-attendees in both categories of need for CE-services. For math, attendees in need of CE gain somewhat more over the summer than non-attendees. The declines among students who need CE occur more frequently in the non-attendee group. For students who do not need CE, the gains (with the

Table 4-12

Mean Student Gains (VSS) for Five Cohorts of Title I Students Enrolled in Title I 'Projects' Exhibiting Four Levels of Gain in the Preceding School Year by Student Attendance at Summer School

	Students' Summer Gains							
	Projects' Standing on School-Year Gains (in Quarters)							
Cohort Attendance	**Lowest**		**Second**		**Third**		**Highest**	
	Reading							
	N	Gains	N	Gains	N	Gains	N	Gains
Cohort 1-2								
Attendees	102	16.58	46	5.07	69	3.72	67	−2.69
Non-Attendees	201	9.45	150	3.99	202	1.98	371	0.01
Cohort 2-3								
Attendees	65	3.42	99	0.33	45	10.09	126	−1.06
Non-Attendees	214	9.26	258	−1.13	183	9.75	296	−3.61
Cohort 3-4								
Attendees	98	4.49	145	−0.94	104	−0.70	106	−9.96
Non-Attendees	222	10.39	294	2.67	228	1.25	229	−8.45
Cohort 4-5								
Attendees	108	7.02	25	10.12	37	−2.97	106	−13.42
Non-Attendees	217	3.14	182	6.37	182	3.51	239	−3.18
Cohort 5-6								
Attendees	51	5.71	55	6.64	51	5.92	45	8.11
Non-Attendees	162	8.60	198	6.85	147	2.78	174	0.59

Table 4-12 (Continued)

	Math							
	N	Gains	N	Gains	N	Gains	N	Gains
Cohort 1-2								
Attendees	27	5.74	80	1.93	36	5.11	38	−12.00
Non-Attendees	40	7.15	118	−0.15	148	−0.26	168	−9.11
Cohort 2-3								
Attendees	35	23.34	92	17.02	12	−5.83	65	−1.18
Non-Attendees	147	16.09	111	10.17	84	−9.15	138	−11.96
Cohort 3-4								
Attendees	121	−1.12	105	−1.26	44	2.77	58	−14.02
Non-Attendees	163	−6.07	202	−1.04	100	1.11	124	−9.20
Cohort 4-5								
Attendees	21	−6.38	92	10.67	491	−10.82	15	0.60
Non-Attendees	82	3.70	109	−3.19	174	−6.84	125	−9.89
Cohort 5-6								
Attendees	75	13.01	31	10.61	14	7.00	40	−4.55
Non-Attendees	123	11.69	103	10.51	109	−0.46	122	−7.54

Table 4-13

Fall-to-Spring and Spring-to-Fall Test-Score Differences (VSS) for Reading and Math, for Five Cohorts, by Teacher Judgment of Need for CE

Cohort Attendance	N		Test-Score Differences Fall, 1976 to Spring, 1977		Test-Score Differences Spring, 1977 to Fall, 1977	
	CE Needed	CE Not Needed	CE Needed	CE Not Needed	CE Needed	CE Not Needed
Reading						
Cohort 1-2						
Attended	510	543	57	67	7	12
Not Attended	1918	4595	61	69	6	12
Cohort 2-3						
Attended	651	520	42	40	5	8
Not Attended	2281	3879	43	45	5	8
Cohort 3-4						
Attended	846	537	34	30	0	11
Not Attended	2232	4057	36	33	1	13
Cohort 4-5						
Attended	637	453	32	30	2	11
Not Attended	2370	4022	32	30	3	9
Cohort 5-6						
Attended	489	424	23	25	8	13
Not Attended	2112	4048	26	29	6	10
Math						
Cohort 1-2						
Attended	515	544	61	62	3	8
Not Attended	1915	4601	58	67	4	4
Cohort 2-3						
Attended	644	519	50	54	5	4
Not Attended	2282	3882	52	58	–1	–1
Cohort 3-4						
Attended	845	539	51	53	–4	5
Not Attended	2208	4031	55	59	–4	3
Cohort 4-5						
Attended	624	447	50	51	0	0
Not Attended	2363	4049	52	52	–5	–4
Cohort 5-6						
Attended	489	424	38	49	6	1
Not Attended	2133	4141	41	45	1	1

exception of cohort 5-6) in math also slightly favor students who attend summer school. In cohort 4-5, where both attendees and non-attendees who are not in need of CE exhibit no gain or loss during the summer, the actual loss occurs in the non-attendee group.

Summer School Effects, Race/Ethnicity and Economic Status

The final subsets of the sample for which the data are separately examined are those defined according to participation in meals programs (our economic indicator), and according to majority/minority status. The results, shown as mean differences, appear in Tables 4-14 and 4-15. The results of the analysis of summer attendance and meal-program participation (Table 4-14) do not support a conclusion that summer school is an effective treatment. In reading, the gains obtained by attendees and non-attendees are very similar among both groups defined on the nutrition-participation variable. Similarly in math, the spring-to-fall differences more frequently favor summer-school attendees in both nutrition-program categories, but the differences are quite small in magnitude. As has been true throughout this chapter, maintenance or improvement in achievement is less the case in math than in reading.

Table 4-14

Fall-to-Spring and Spring-to-Fall Test-Score Differences (VSS) for Five Cohorts, by Student Attendance at Summer School and Student Participation in Nutrition Programs R3

Cohort Attendance	N		Test-Score Differences Fall, 1976 to Spring, 1977		Test Score Differences Spring, 1977 to Fall, 1977	
	Nutrition Participant	Non-Participant	Nutrition Participant	Non-Participant	Nutrition Participant	Non-Participant
			Reading			
Cohort 1-2						
Attendees	544	509	60	64	8	12
Non-Attendees	2689	3824	65	69	7	11
Cohort 2-3						
Attendees	623	548	39	43	6	7
Non-Attendees	2490	3670	41	47	6	8
Cohort 3-4						
Attendees	803	580	33	31	2	9
Non-Attendees	2642	3647	35	33	4	12
Cohort 4-5						
Attendees	646	444	32	28	2	12
Non-Attendees	2679	3713	31	31	5	9
Cohort 5-6						
Attendees	502	411	2	27	9	13
Non-Attendees	2596	3566	24	30	6	11
			Math			
Cohort 1-2						
Attendees	548	511	60	61	6	7
Non-Attendees	2683	383	70	72	5	4
Cohort 2-3						
Attendees	614	549	51	52	7	2
Non-Attendees	2482	3682	60	56	0	–1
Cohort 3-4						
Attendees	801	583	51	55	–2	0
Non-Attendees	2620	3619	55	60	0	2
Cohort 4-5						
Attendees	635	436	50	50	–1	1
Non-Attendees	2687	3725	51	53	–2	–5
Cohort 5-6						
Attendees	500	413	38	48	8	–1
Non-Attendees	2616	3658	39	48	4	–1

Similar results were obtained for minority and majority students as can be seen in Table 4-15. Both attendees and non-attendees, whether minority or majority, increase in their reading achievement over the summer. The differences between attendees and non-attendees in both groups are too small to be of any practical significance. In math, the magnitude of positive changes is smaller than in reading and there are eight declines in test scores. Six of those declines are incurred by majority students and are split evenly among attendees and non-attendees. Among minority students a decline of one point is evident among attendees in cohort 3-4, as is a similar one-point decline in the non-attendee group in cohort 4-5. The differences do not consistently favor either attendees or non-attendees.

Table 4-15

Fall-to-Spring and Spring-to-Fall Test-Score Differences (VSS) for Five Cohorts, by Student Attendance at Summer School and Student Participation in Nutrition Programs

Cohort Attendance	N		Test-Score Differences Fall, 1976 to Spring, 1977		Test Score Differences Spring, 1977 to Fall, 1977	
	Minority	Majority	Minority	Majority	Minority	Majority
Reading						
Cohort 1-2						
Attendees	559	494	64	60	10	12
Non-Attendees	2521	3992	68	67	7	11
Cohort 2-3						
Attendees	629	542	39	43	5	7
Non-Attendees	2318	3842	40	47	4	9
Cohort 3-4						
Attendees	829	554	32	31	5	9
Non-Attendees	2324	3965	34	34	5	11
Cohort 4-5						
Attendees	630	460	31	29	3	11
Non-Attendees	2516	3876	31	31	5	8
Cohort 5-6						
Attendees	536	377	22	27	8	13
Non-Attendees	2497	3663	24	30	7	10
Math						
Cohort 1-2						
Attendees	562	497	64	57	5	7
Non-Attendees	2526	3990	63	54	5	4
Cohort 2-3						
Attendees	621	542	51	52	7	2
Non-Attendees	2312	3852	54	55	2	−2
Cohort 3-4						
Attendees	833	551	50	57	−1	−1
Non-Attendees	2310	3929	53	60	3	0
Cohort 4-5						
Attendees	620	451	51	50	1	−2
Non-Attendees	2550	3862	52	53	−1	−7
Cohort 5-6						
Attendees	533	380	39	48	10	−4
Non-Attendees	2513	3761	38	48	7	−2

Statistical Tests of the Effects of Summer School

To this point in the analysis of the effects of attending summer school, the data have been drawn from the full sample of SES students on the basis of their having attended or not attended summer school. The mean test scores (both vertical-scale scores and percentile ranks) indicate that attending summer school has little positive effect on subsequent test performance. This is the case for each of the subsets of the sample, which were examined separately.

As we pointed out earlier, these separate examinations of the data, while of interest in their own right, are insufficient as a formal test of summer-school effects. Clearly, as is evident from the data above and as discussed in Chapter 3, summer-school attendees differ from non-attendees in initial achievement levels as well as in other characteristics that may be related to achievement growth. Given this situation, an approach that accommodates those differences is required. We thus present the results of multiple regression analyses of fall posttest on spring pretest and a dummy variable representing student attendance at summer school. This regression analysis is intended to provide a formal test of the effects of attending summer school while controlling for the effects of other factors that are related to posttest (i.e. fall, 1977 performance).

As noted in Chapter 2, the non-compulsory nature of summer programs makes inferences rather tenuous. The design problems encountered in virtually all non-experimental evaluations —most notably the difficulty in identifying truly equivalent comparison groups—are exacerbated when dealing with summer school due to a potentially large degree of selection bias. We should note that the selection bias probably operates in favor of finding positive effects associated with attending summer school. Nevertheless, in order to alleviate the problem of potential selection bias associated with attendance at summer school, we limited non-attendees in the sample for the regression analysis to those whose districts did not have summer programs abailable to their students.

In order to exert some control over other biasing effects of the differences between attendees and non-attendees, we performed the regression analyses on both the full complement of students within a cohort (after selecting the non-attendees from the districts not offering summer programs) and on selected subsets of students (i.e., we performed the regressions separately for subsets of the sample). In these latter regressions we subset the sample by CE selection status (Title I, Other-CE and non-CE) and on quarters of school-year achievement (indexed by the average of fall and spring percentile ranks).

The results of the regression analysis for each cohort in both reading and math are shown in Table 4-16. The regression results shown ignore all classification distinctions among students other than the one represented by the dummy variable for attendance. The models, as specified in preliminary analyses, included the previous year's program costs as a control variable for differential treatment during the preceding school year. Generally, the inclusion of that control variable was without effect. The coefficients for the preceding year's costs were small and consistently negative in every cohort in both subject matters. Since the coefficients merely confirmed the general results reported by Sumner et al. (1979) that higher-cost programs are provided to lower-achieving students, and did not add any appreciable explanatory power to the models, the variable was dropped from the analysis.

As is the case throughout the remainder of this report, the regression models specified the fall posttest score as the dependent variable, with spring pretest treated as an independent variable. In preliminary analyses we also specified simple gain scores and residual gain scores (where the residual gain score is the deviation of the obtained posttest score from that predicted by the general regression of posttest on pretest within each cohort) as the outcome measure. The results were not altered by specification of the outcome measure.

The results shown in Table 4-16 are not encouraging with respect to the overall effectiveness of summer programs. None of the coefficients of the summer-attendance variable are statistically significant. In reading, negative coefficients were obtained in three of the five cohorts (2-3, 3-4, and 4-5). None of these three coefficients is very large and none is statistically significant. Both of the positive coefficients are likewise rather small. The results of the regression analysis of the math data were similar. Again, only small and frequently negative coefficients were obtained for the attendance variable, with none of the coefficients being significant.

The values shown in the parentheses of Table 4-16 are the proportions of variance uniquely accounted for by each of the two explanatory variables (summer attendance and spring pretest). The proportions of variance explained were obtained by treating each of the two variables as if it were the last to enter the regression equations. As is clear from the data, summer attendance adds only the most trivial, if any, explanatory power to the regressions over and above the pretest score.

Zero-order correlations between summer-school attendance and fall scores have been included in Table 4-16. In each cohort for both subject matters the correlations are negative and not very large. The squares of the zero-order correlations provide an estimate of the posttest variance that would be accounted for were pretest to be ignored completely. In that event, not more than three percent of the posttest variance would be explained by the attendance variable.

We also note that the correlations of the attendance variable and spring pretest are very similar to those shown in Table 4-16 for fall posttest. The average correlation over cohorts in reading between pretest and attendance was -.14 compared to the average of -.13 for the correlation with posttest. For math, the average attendance correlation with pretest was -.11 as compared to -.09 for the correlation of attendance with posttest.

Treating the reading and math results concurrently, attendance at summer school neither adds to nor detracts from student achievement in any dependable fashion. Even were we more confident in the significance of the coefficients, the conclusions would be the same, given coefficients of these magnitudes associated with a dummy variable, and given the negligible amounts of variance explained by the attendance variable.

As indicated, similar regression models were estimated separately for students in each of three CE selection Categories (Title I, Other-CE, and non-CE). The results of these regression analyses are displayed in Tables 4-17 and 4-18. The proportions of variance in the posttest explained uniquely by each of the two explanatory variables are provided in Table 4-17. The

Table 4-16

Regression Coefficients and Proportions of Posttest Variance for Summer-School Attendance for Five Cohorts[1] (Non-Attendees Drawn from Districts Not Offering Summer School)

Cohort	N	Summer Attendance	Spring Pretest	Constant	Zero-Order Correlation of Summer Attendance and Fall Posttest Score	R^2
			Reading			
1-2		.95	.90**			
	2661	(.0001)	(.6490)	52.02	–.09	.66
2-3		–1.76	.89**			
	2678	(.0002)	(.6913)	59.80	–.18	.72
3-4		–1.91	1.00**			
	2639	(.0002)	(.7140)	9.55	–.14	.73
4-5		–1.69	.94**			
	2600	(.0001)	(.7660)	36.66	–.15	.79
5-6		2.33	.97**			
	2653	(.0002)	(.8231)	23.46	–0.5	.83
			Math			
1-2		–.96	.73**			
	1998	(.0001)	(.5187)	111.40	–.08	.53
2-3		.48	.77**			
	2682	(.0000)	(.6001)	103.40	–.09	.61
3-4		–1.46	.88**			
	2636	(.0001)	(.6235)	60.94	–.12	.64
4-5		–.69	.84**			
	2582	(.0000)	(.6678)	84.03	–.13	.69
5-6		.47	.84**			
	2735	(.0000)	(.6969)	91.55	–.02	.70

[1] Proportion of variance explained in parentheses

*$P < .05$

**$P < .01$

estimated regression coefficients are shown in Table 4-18. When viewed in terms of the proportions of posttest variance accounted for by the summer-school attendance variable (Table 4-17), and in terms of the size and significance of the estimated regression coefficients (Table 4-18), the regression results provide virtually no evidence for the effectiveness of summer school. Similar results were obtained in analyses that subset students on the basis of their 1976-77 achievement status. The results shown in Table 4-18 indicate only three coefficients of the attendance variable that are at least twice as large as their standard errors. Two of those coefficients were obtained for Title I students in reading, however, one is positive and the other is negative.

Table 4-17

Proportions of Reading and Math Posttest Variance Accounted for by Pretest and Summer School Attendance, by CE Selection Category for Five Cohorts

Cohort	N	Proportion of Posttest Variance Accounted for by Pretest	Proportion of Posttest Variance Accounted for by Attendance	R^2
		Reading		
Cohort 1-2				
Title I	327	.4939	.0097	.5005
Other-CE	181	.6607	.0010	.6608
Non-CE	2153	.6337	.0005	.6347
Cohort 2-3				
Title I	489	.5070	.0000	.5113
Other-CE	256	.6818	.0034	.6835
Non-CE	1939	.6930	.0005	.7091
Cohort 3-4				
Title I	466	.4906	.0028	.5028
Other-CE	203	.6592	.0013	.6751
Non-CE	1970	.6942	.0001	.6946
Cohort 4-5				
Title I	304	.4085	.0117	.4522
Other-CE	182	.6792	.0009	.6907
Non-CE	2114	.7957	.0004	.7957
Cohort 5-6				
Title I	298	.6157	.0000	.6217
Other-CE	182	.7250	.0002	.7540
Non-CE	2114	.8140	.0006	.8144
		Math		
Cohort 1-2				
Title I	155	.3288	.0000	.3288
Other-CE	98	.4129	.0051	.4535
Non-CE	2409	.5176	.0001	.5213
Cohort 2-3				
Title I	226	.3988	.0084	.4160
Other-CE	125	.5372	.0053	.5615
Non-CE	2331	.6031	.0000	.6087
Cohort 3-4				
Title I	260	.4448	.0001	.4592
Other-CE	143	.4959	.0089	.6371
Non-CE	2233	.6185	.0000	.6210
Cohort 4-5				
Title I	199	.4650	.0006	.4714
Other-CE	100	.6499	.0016	.6550
Non-CE	2283	.6692	.0000	.6748
Cohort 5-6				
Title I	221	.4392	.0006	.4694
Other-CE	66	.5787	.0104	.7335
Non-CE	2448	.6882	.0000	.6895

In both reading and math, the attendance variable contributes relatively little to the fall posttest score (Table 4-17), when the spring pretest is considered. Among the various CE categories, the overall mean proportions of contributing variance for summer-school attendance are not very different: .0048 for Title I, .0014 for Other-CE and .0004 for non-CE reading; and .0019 for Title I, .0063 for Other-CE, and effectively zero for non-CE math. Only once is more than one percent of the posttest variance explained by the attendance variable, in the math results for Other-CE students in cohort 5-6. In that cohort, for math, the estimated regression coefficient is also reasonably large and positive but not statistically significant.

Table 4-18

Regression Analysis Results for Summer School Attendance, by CE Selection Category for Five Cohorts, by Reading and Math

Selection Category	Pretest	Attendance	Constant	R^2
		Reading		
Cohort 1-2				
Title I	.78**	7.70*	81.74	.50
	(.04)	(3.07)		
Other-CE	.83**	–2.99	74.49	.66
	(.04)	(4.13)		
Non-CE	.88**	2.77	61.31	.63
	(.01)	(1.58)		
Cohort 2-3				
Title I	.73**	–0.60	116.70	.51
	(.03)	(2.71)		
Other-CE	.79**	5.53	100.85	.68
	(.03)	(3.40)		
Non-CE	.90**	–3.00	56.01	.71
	(.01)	(1.63)		
Cohort 3-4				
Title I	.78**	–4.57	98.16	.50
	(.04)	(2.84)		
Other-CE	1.07**	4.45	–26.21	.68
	(.05)	(4.95)		
Non-CE	.97**	1.63	28.62	.69
	(.01)	(1.93)		
Cohort 4-5				
Title I	.70**	–11.23*	143.33	.45
	(.04)	(4.43)		
Other-CE	.82	–3.99	97.06	.70
	(.04)	(5.44)		
Non-CE	.94**	3.34	28.38	.80
	(.01)	(1.68)		
Cohort 5-6				
Title I	.85**	–0.47	81.99	.62
	(.04)	(3.85)		
Other-CE	.88**	1.73	62.66	.75
	(.05)	(6.41)		
Non-CE	.97**	4.83*	26.50	.81
	(.01)	(1.76)		

Table 4-18 (Continued)

		Math		
Cohort 1-2				
Title I	.56**	−4.23	163.73	.33
	(.06)	(5.40)		
Other-CE	.59**	6.18	154.62	.45
	(.07)	(6.57)		
Non-CE	.73**	1.10	112.01	.52
	(.01)	(1.54)		
Cohort 2-3				
Title I	.58**	8.26	175.20	.42
	(.04)	(4.61)		
Other-CE	.86**	8.56	61.64	.56
	(.07)	(7.03)		
Non-CE	.78	−0.71	100.09	.61
	(.01)	(1.62)		
Cohort 3-4				
Title I	.72**	−0.92	127.78	.46
	(.05)	(4.40)		
Other-CE	.89**	13.24	41.06	.64
	(.06)	(7.14)		
Non-CE	.87**	−0.53	65.90	.62
	(.01)	(1.98)		
Cohort 4-5				
Title I	.67**	−2.42	161.23	.47
	(.05)	(5.22)		
Other-CE	.76**	−5.04	125.88	.65
	(.06)	(7.50)		
Non-CE	.84**	1.50	81.77	.67
	(.01)	(1.99)		
Cohort 5-6				
Title I	.74**	3.02	135.22	.47
	(.06)	(6.26)		
Other-CE	.85**	16.51	72.39	.73
	(.07)	(10.54)		
Non-CE	.83**	0.80	98.86	.69
	(.01)	(2.19)		

Standard errors of the coefficients in parentheses.
*$P < .05$
**$P < .01$

In total, the regression results in the sample subset by the three CE selection categories are consistent with the results obtained with the samples not subset. The two sets of regression analyses confirm the conclusion that summer school has little substantive effect on achievement growth.

In addition to the regression analyses reported above, similar analyses were performed using an alternative measure of student experience over the summer. This alternative measure is a composite named Summer Intellectual Experience. The construction of the composite is described in Technical Report #9 from the SES (Hemenway et al., 1979). Suffice it to say that this composite includes experiences other than formal schooling in its assessment of student summer activities; however, formal summer school is the largest component of the composite.

The results of these regressions, which were estimated in a fashion similar to those reported above, were essentially the same as those obtained employing the attendance variable. Accordingly, we do not present the data in this report. The R^2 values were basically unchanged and the regression coefficients were small. This is not surprising since the composite indicator was heavily weighted toward summer school attendance.

Alternative Models to Test the Effects of Summer School

Our approach to the estimation of the various regression equations reported above was to allow the measures of prior achievement (pretest scores) and students' CE selection status to serve as proxies for other variables that are known to be related, in the predictive sense, to growth in student achievement. Those other variables are, or course, indicators of family background and socio-economic status. It is our contention that pretest scores (which have not always been available in large-scale studies, for example Coleman's Equality of Educational Opportunity Survey) are adequate proxies for the student background variables. Our preference for this approach is based largely on our overall concern with variables that are directly relevant to the educational process.

Of course, the procedure we use raises the possibility that the regression models employed to test the effects of attending summer school may be rather misspecified. Such a misspecification could well cause us to err in our evaluation of the effects of the treatment variable. In order to assess the degree to which the conclusions concerning summer school are dependent upon a particular estimation strategy, we also estimated an alternative regression model that included other measures of family background and socio-economic status associated with students and schools. The purpose of the additional regressions was limited to testing whether or not the evaluation of summer school as a treatment was being affected by the rather minimal specification of our regression equations.

The alternate model was of the following form: pretest and summer school attendance were entered into the regression on the first step; on the second step, student-level indicators of socio-economic status (race, nutrition program participation, and mother's education) were entered along with student sex; school-level indicators were entered on the third and final step of the solution (percent minority students, percent of students participating in free-lunch programs, and percent of students from homes where English is not the first language).

The tests of the alternative models summarized in Tables 4-19 and 4-20 support strongly the conclusion that the estimates of the effectiveness of summer school are unchanged under either model specification. Two criteria against which the changes in the results can be measured are shown in the tables. The first criterion is the amount of additional variance in the posttest accounted for by the inclusion of the additional predictor variables in the second model (increments to the regression coefficients of determination). The second criterion, assessments of changes in the individual estimates of the coefficients of the attendance variable, has two aspects: first, whether the sign of the coefficient changed and second, whether the statistical significances of the coefficient was altered by the second model specification.

The results, as shown, indicate that the addition of the variables representing family background (i.e. race, mother's education, and lunch-program participation) and school-level

Table 4-19

Summary of Two Alternative Specifications of the Regression Analysis of the Effects of Summer School—Reading

	Criteria			
Selection Category	**Increase in R^2 Associated with Model II**	**Change in the Sign of the Coefficient for Attendance**	**Change in Significance of Coefficient**	**Comments**
Cohort 1-2	.01706	No	No	
Title I	.02313	No	No	
Other-CE	.02816	Yes	No	Both Not Significant
Non-CE	.01627	No	No	
Cohort 2-3	.01018	No	No	
Title I	.01894	No	No	
Other-CE	.00997	No	No	
Non-CE	.01156	No	Yes	II Significant
Cohort 3-4	.00780	No	No	
Title I	.00550	No	No	
Other-CE	.04755	No	No	
Non-CE	.00971	Yes	No	Both Not Significant
Cohort 4-5	.01150	No	Yes	II Significant
Title I	.07392	No	Yes	I Significant
Other-CE	.02087	No	No	
Non-CE	.00760	No	Yes	I Significant
Cohort 5-6	.00306	No	No	
Title I	.00946	Yes	No	Both Not Significant
Other-CE	.02134	Yes	No	Both Not Significant
Non-CE	.00265	No	No	

socioeconomic status indicators (i.e. percent of students who are members of minority groups, percent of students who participate in lunch programs, and percent of students from homes where English is is not the first language) does result in a model that accounts for some additional variance in the posttest over and above that accounted for by the pretest scores. However, the increases in the coefficients of determination are not at all large. They range from less than one percent to less than three percent of total posttest variance in reading for the analysis of entire cohorts; in math the increase is on the order of one percent in each of the five cohorts. The improvement to the R^2 values is a bit more pronounced in those analyses where the regressions were estimated separately within the three CE groups. The range in those cases being on the other of one-half of one percent to about seven percent of additional posttest variance accounted for by Model II in reading. In math, the second model accounts for an additional one to five percent.

Examining the results according to the second criterion leads quite directly to the conclusion that both models yield similar estimates of the effectiveness of summer school. In the analyses of full cohorts the sign of the coefficient associated with the attendance variable does not change in any of the cohorts in reading. The sign changes in but one cohort (5-6) in math. In that one case both models estimate non-significant coefficients of opposite sign.

Table 4-20

Summary of Two Alternative Specifications of the Regression Analysis of the Effects of Summer School—Math

	Criteria			
Selection Category	Increase in R^2 Associated with Model II	Change in the Sign of the Coefficient for Attendance	Change in Significance of Coefficient	Comments
Cohort 1-2	.01048	No	No	
Title I	.04150	No	No	
Other-CE	.04413	Yes	No	Both Not Significant
Non-CE	.00720	No	No	
Cohort 2-3	.00972	No	No	
Title I	.01894	No	No	
Other-CE	.04598	Yes	No	Both Not Significant
Non-CE	.01203	No	No	
Cohort 3-4	.00914	No	No	
Title I	.02057	No	No	
Other-CE	.03495	Yes	No	Both Not Significant
Non-CE	.00989	No	No	
Cohort 4-5	.01039	No	No	
Title I	.05210	No	No	
Other-CE	.04660	No	No	
Non-CE	.00894	Yes	No	Both Not Significant
Cohort 5-6	.00941	Yes	No	Both Not Significant
Title I	.03175	No	No	
Other-Ce	.02355	No	No	
Non-CE	.00792	Yes	No	Both Not Significant

Looking at the results separately for the three subsets based on CE status, we note that the sign of the regression coefficient changes in four cases in reading. In all four of those cases both models estimate coefficients that are not statistically significant. In another four instances (in reading) one of the two regression models estimates a significant coefficient while the other model (Model II) indicates that the non-significant and negative coefficients estimated by Model I are significant in two cases; similarly, Model I estimates two significant coefficients that are not significant under Model II.

In math, the sign changes in five of the fifteen cases of the coefficients of the attendance variable in the analyses subset by CE category. In none of those cases does the second model alter the judgment of the significance of the coefficient, however. In all cases in math, both models estimate coefficients for the attendance variable that are less than twice the size of their respective standard errors.

In evaluating the degree to which the more detailed model improves the estimates on the attendance variable, we should probably focus somewhat on changes from negative estimates obtained under Model I to positive and significant estimates obtained under Model II. That is, are the generally negative assessments of the efficacy of summer school arrived at on the basis of Model I altered by the specification of the regression analysis in the second model? (Surely, there can be no question that our preferred model overestimates the effectiveness of summer school.) No such changes are evident in the results shown in Tables 4-19 and 4-20.

In further considering the results of the regression analyses, we need to consider the likelihood that the results would be different under still other alternative specifications of the analyses. Given the lack of truly substantial change in the assessment of the efficacy of summer school and the small amounts of additional variance explained by the second model, it appears very unlikely that further and more sophisticated models would alter the conclusion that summer school has little effect on subsequent test scores.

Testing the sensitivity of the regression analyses by different models results in a net reduction in the available sample sizes. Appendix D, with supplemental information of sample size variations, contains similar regressions based on a sample that differs along two lines. The results given in Appendix D (See Tables D-17 and D-18) are quite consistent with those discussed here. They are based on the semi-longitudinal sample and include students whose data files lacked certain family background information. Specifically, our measure of the mother's education (a critical indicator of socioeconomic status) was obtained for each child from the teacher. Because this can be a rather difficult estimate for teachers to make, one of the allowable response-alternatives was "cannot estimate." This particular response category was fairly common in the data. That being the case, the number of students entering the regression analysis is reduced. Although the results, with respect to the summer school attendance variable are barely affected by this, we mention this example specifically in support of our preferred procedure that relies on pretest scores as proxies for the predictive effects associated with family background or other socioeconomic status measures. It seems reasonable to assume that students whose teachers were unable to estimate parental attainments are more likely to be from families at the lower end of the socioeconomic scale. This is borne out by the fact that the range of Title I students whose teachers reported the missing or "cannot estimate" response on mother's education (34 to 44 percent* based on reading files) was rather substantial.

Therefore, the approach of using the pretest score as the primary control variable in the analysis not only results in similar estimates of the effects of the treatment variable but also in estimates that are based on more complete samples of students.

Both of the models examined led to the same conclusion regarding the effectiveness of summer school. Namely, summer schools, as they operated in the summer of 1977, are not an effective mechanism for increasing student achievement over the summer months. Both models tested the degree to which that assessment was dependent upon the particular model used. The alternative model (the summary of which is shown in Tables 4-19 and 4-20) added, in hierarchical sets, measures of family background and descriptors of each school's socioeconomic status to the basic regression model which consisted of the pretest and the dummy variable for summer school attendance. The results (in terms of increments to the fit of the basic model and changes in the assessment of summer school's effectiveness) as shown in the tables are, by any standard, that summer school does not increase achievement in reading or math.

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*The general percent of students for whom this response was given is 24.1 percent projected to the national population as reported by Hemenway et al., 1978 in Technical Report #9 of the SES.

Although, clearly, the pretest variable does not capture all of the predictable variance in the dependent measure, equally clearly the estimates of summer school effects are invariant with regard to the particular model. Further, given the difficulties that arise in attempting to estimate the specific effects on one variable in the face of multicollinearity, it seems prudent to avoid the fuller model. The question at hand is not whether family background is related to achievement—even after controlling for pretest differences, as our models do—but rather how are estimates of the treatment affected by their inclusion in or exclusion from the regression analysis? The summary data given in Tables 4-19 and 4-20, when compared to those from the basic model, indicate that mis- or under-specification is not leading us to draw the wrong conclusion from the data.

At What Grade Levels Are Summer Programs More Effective?

Based on the regressions that treated the entirety of each cohort independently of CE status, the conclusion is that differential effects associated with summer school are not evident in the data. The results were relatively similar for all cohorts, indicating that summer school is not differentially effective by grade level.

SUMMARY

The analyses presented in this chapter were addressed to major policy questions about student growth over the summer and the effectiveness of summer school. First, the maintenance of achievement growth over the summer was examined. For students in general, a loss in achievement during the summer was found in only one case (math in cohort 4-5). Typically, small increases in test scores over the summer are the rule.

We then examined the change in test scores over the summer separately for CE and non-CE students. Both the mean vertical scale and percentile scores were used in this analysis. The results, generally, do not indicate absolute loss over the summer for either CE or non-CE students. It was also clear, however, that the amounts of gain made during the summer by CE students are slightly less than those made by non-CE students. CE students appear not to progress quite as much during the summer as their non-CE peers. We also note that this relative loss was not at all large.

Growth over the summer was also examined separately for other important subsets of the student sample (Title I, students at four levels of achievement status, participants and non-participants in free-lunch programs, and majority and minority students). Generally, ignoring summer school attendance, the analyses of summer growth for these additional subsets were similar to those derived in the analysis of CE and non-CE students. As indicated in the analysis of Title I projects, the aggregation of the data to the national level may mask phenomena at individual sites; that is, students in some settings may regress during the summer while those in other settings may improve, making the overall picture look as portrayed here. More complete site-by-site contrasts are beyond the scope of this report, but such further speculation are partly addressed in the next chapter.

The effectiveness of summer school in promoting student achievements over the summer was addressed both by an analysis of the mean gains during the summer among various groups of students and by regression analysis using attendance at summer school as a dummy variable. The results of the analysis of the mean gains indicated little effect of attending summer school for any subset of students. Similar results were evident in the separate examination of the data for Title I students, as well as in the analysis of Title I projects. Similarly, the regression analyses indicated that the variable of attendance did not account for any appreciable amounts of posttest variance over and above those accounted for by pretest (spring) scores. Similar results were obtained with an alternative regression model using socioeconomic variables as additional predictors.

In terms of potential implications for educational policy, the results presented in this chapter suggest that the decision to offer summer programs as presently conducted should not be justified in terms of achievement growth or maintenance. While the results indicate that CE students do not exhibit summer loss in the absolute sense, they do grow at a somewhat slower rate than do their non-CE counterparts. However, those CE students who do attend summer programs do not show much greater growth than either CE students or non-CE students who do not attend summer school. Thus, although the data provide some confirmation of a relative loss over the summer, they do not provide much, if any, support for the effectiveness of summer school in combating relative summer loss. Figures 4-3 and 4-4 graphically indicate the general lack of effects associated with summer school for CE children.

The results reported in Chapter 3 offer some explanation of why summer school is so ineffective in producing growth in achievement. The data on both the cost of summer programs and on the intensity (as measured by hours of instruction) clearly demonstrate that summer programs are too brief and unintensive to achieve much in the way of achievement growth. The 52 programs described in Chapter 3 offer 15 to 21 hours of instruction in reading and 8 to 18 hours in math (based on the means for students in three CE-selection categories). In contrast, CE students receive during the regular terms, between 200 and 300 hours of reading instruction and between 175 and 200 hours of math instruction. On balance, it may be quite unreasonable to expect such minimal summer programs to produce incremental gains on the part of their students.

We should also note that other researchers (Heyns, 1978; David, 1979) report that summer schools are quite well received by both participants and school staff. None of the results we report in this chapter addresses other aspects of summer programs such as keeping children in a monitored environment, helping working mothers in providing a place for their children, and additional socially useful functions other than reading and math instruction.

In the analyses of the early sections of this chapter and in the analyses of the effectiveness of summer school, differences between growth in reading and growth in math were noted. It may be that gains in reading are more easily maintained in the absence of effective instruction than are gains in math. This, too, can be seen in Figures 4-3 and 4-4.

All in all, the results described in this chapter do not provide much evidence for the efficacy of summer programs. However, our measure of summer programs was based on an attends versus a does-not-attend dichotomy. It may be that using attendance as a proxy for actual treatment during the summer serves to mask the effects of summer school treatments. That issue is pursued in the following chapter.

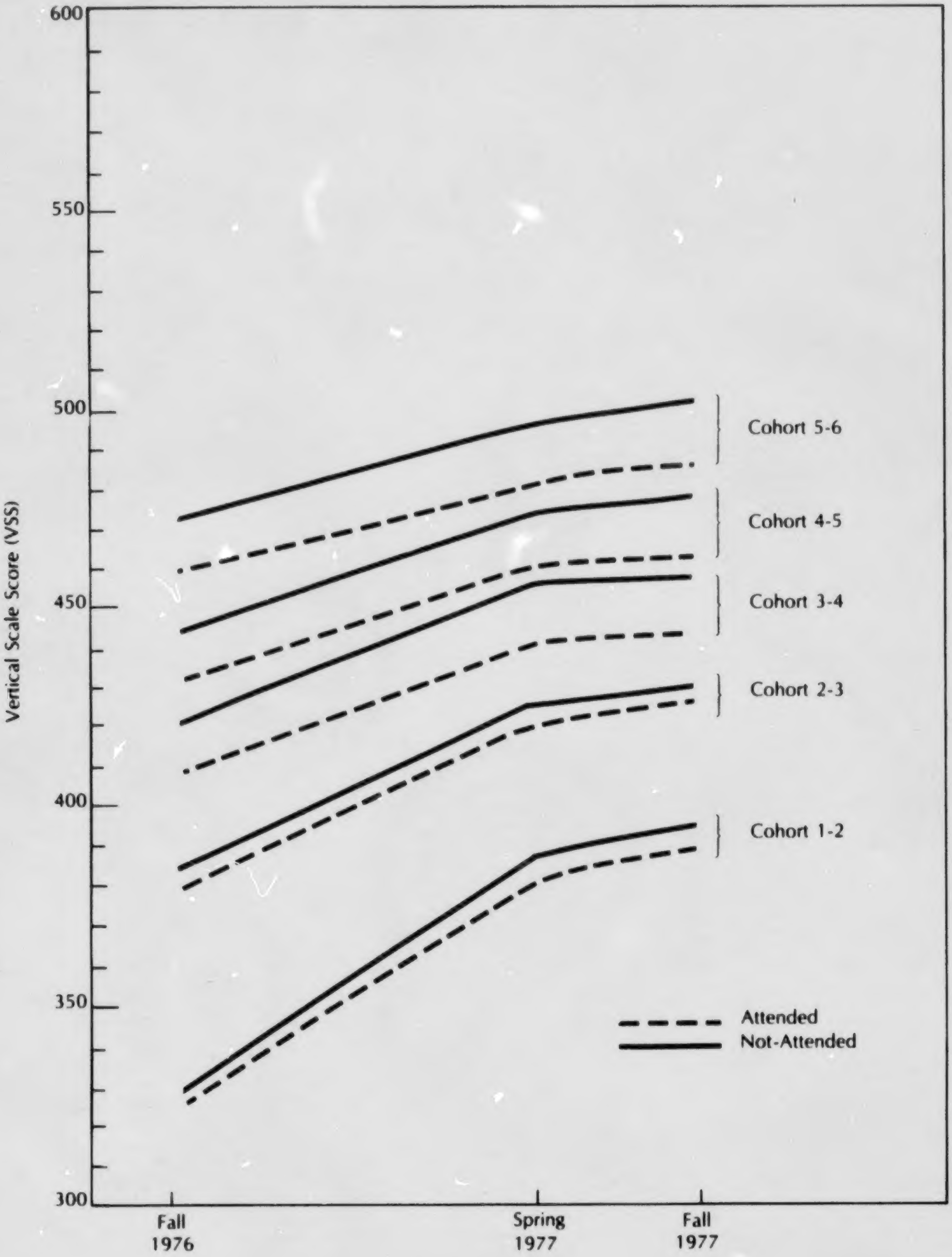

Figure 4-3

Reading Achievement of Compensatory Education Students by Summer School Attendance

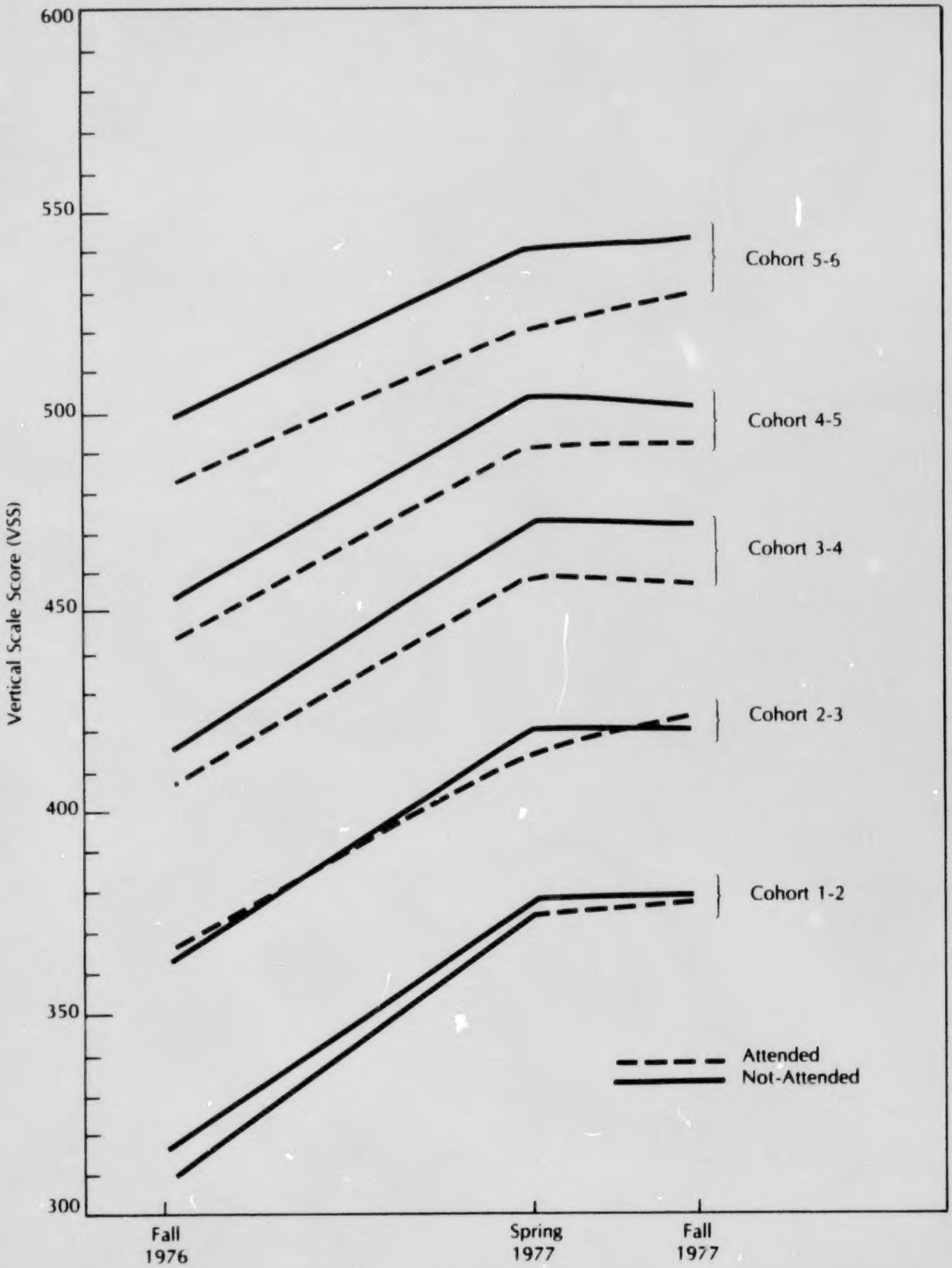

Figure 4-4

Math Achievement of Compensatory Education Students by Summer School Attendance

CHAPTER 5. COST/EFFECTIVENESS ANALYSIS OF SUMMER PROGRAMS

Although the overall result observed in the preceding chapter was rather negative with respect to the effectiveness of summer programs in general, the possibility remains that differential effectiveness and/or cost-effectiveness may be evident among alternative summer programs. This chapter explores that possibility, using data obtained from the 52 sites that comprise the sample for this component of the summer study.

About 2,500 of the self-reported attendees were enrolled in programs at the 52 sites about which we obtained data. Full cost, exposure, and achievement data were available for these students. The sample size for the analyses of this chapter is slightly less than we had anticipated, but still serves as an adequate basis for addressing the policy questions on the cost/effectiveness of summer programs.

The strategy we use to estimate the cost/effectiveness of alternative summer programs is similar to the one employed in our analysis of regular-year programs (Sumner et al., 1979). We use the estimated regression coefficients of program cost in relation to student achievement as indices of the cost/effectiveness of alternative treatments. In linear models, such indices* would reflect the expected change in posttest scores associated with unit increases in program costs net of the effects of other variables (e.g., pretest scores) in the regression equation. We now turn to the policy questions addressed in the cost/effectiveness analysis of summer programs.

Do Students Who Attend Summer-School Programs Using More Resources Exhibit More Achievement Growth During the Summer?

Our approach to this question involves specifying a series of regression models to test the association of the cost of instructional resources (and, hence, treatment intensity) with achievement growth. The relevant achievement data for summer school attendees are exhibited for entire cohorts and for three CE selection categories in Table 5-1.

The achievement data in Table 5-1 generally show that, in this sample of students, achievement decline is not common either for CE students or non-CE students. The only decline in the reading data is for Title I students, who, in this sample of attendees, incur a three-point decline in average reading score in cohort 3-4. Generally, the increases over the summer are smallest in the Title I group, which also exhibits the lowest pretest scores.

In the math portion of Table 5-1, four declines in test scores are present. Again, Title I students in cohort 3-4 show a decline of three vertical-scale points. Title I students in cohort 1-2 drop two score points over the summer. The overall (total) data for cohort 4-5 shows a drop-off

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*This approach carries with it the implicit assumption that similar gains in achievement are to be expected from programs using different mixes of resources having the same total cost. Models that allow for differences in the way resources are used in instruction, using program component rather than total costs, are presented subsequently in the chapter.

Table 5-1

Summary Achievement Data for Five Cohorts of Summer School Attendees by CE Selection Status

Selection Category	N	Pretest (Spring, 1977)		Posttest (Fall, 1977)		Gain
		Mean	S.D.	Mean	S.D.	
Reading						
Cohort 1-2 (Total)	584	394	45	404	45	10
Title I	233	379	39	387	40	8
Other-CE	123	397	37	402	41	5
Non-CE	228	408	37	423	46	15
Cohort 2-3 (Total)	592	434	46	443	47	9
Title I	219	420	39	424	41	4
Other-CE	145	429	50	442	48	13
Non-CE	228	452	41	462	47	10
Cohort 3-4 (Total)	512	463	51	466	58	3
Title I	226	441	42	438	44	–3
Other-CE	119	461	46	466	51	5
Non-CE	167	495	50	504	47	9
Cohort 4-5 (Total)	448	488	60	493	61	5
Title I	169	462	50	462	50	0
Other-CE	80	471	45	478	50	7
Non-CE	199	517	58	525	59	8
Cohort 5-6 (Total)	335	515	59	523	62	8
Title I	139	486	44	493	50	7
Other-CE	53	514	62	519	63	5
Non-CE	143	544	57	553	59	9
Math						
Cohort 1-2 (Total)	523	387	45	390	45	3
Title I	143	377	41	3[illegible]5	38	–2
Other-CE	102	387	39	393	39	6
Non-CE	278	391	46	396	49	5
Cohort 2-3 (Total)	489	434	49	441	51	7
Title I	115	412	47	425	45	13
Other-CE	118	428	45	438	53	10
Non-CE	256	446	48	449	51	3
Cohort 3-4 (Total)	422	477	51	479	57	2
Title I	154	458	50	455	51	–3
Other-CE	101	483	46	488	61	5
Non-CE	167	491	49	495	53	4
Cohort 4-5 (Total)	403	519	61	518	63	–1
Title I	146	494	53	495	58	1
Other-CE	62	518	50	518	54	0
Non-CE	195	537	61	535	63	–2
Cohort 5-6 (Total)	314	560	63	565	67	5
Title I	106	521	50	525	59	4
Other-CE	54	558	61	572	76	14
Non-CE	154	587	59	589	56	2

of one point. Generally, the magnitude of score changes in math are on the order of those in reading.

The data of Table 5-1 confirm the data presented in Chapter 3 on the general pool of attendees and non-attendees at summer school, and in Chapter 4 confirm the lack of a meaningful absolute drop-off in achievement experienced over the summer by CE students. They do so, however, for a sample of students who received instruction over the summer. Nevertheless, if summer drop-off is at all a general phenomenon, one might expect to find more discrete instances of the decline than are evident in Table 5-1.

The results of the regression analyses of the relationship of program cost to achievement are provided in Table 5-2. The unique proportions of variance in the posttest score explained by each independent variable* are shown for reading and math.

For full cohorts of attendees, the cost of instructional resources used during summer school accounts for substantially less than one percent of the posttest variance in both reading and math. Averaged over cohorts, the proportions of variance accounted for are .0003 in reading and .0020 in math. Within CE categories, the proportions of variance accounted for by the program-cost variable are quite meager as well. For reading, all of the value are less than one percent of the posttest variance. No clear differences are evident among the three CE categories. For math, the program-cost variable does not account for any appreciable amount of variance in the posttest scores within CE categories.

Since the results of the regression analyses were so uniform, the estimated regression coefficients, themselves, are presented in Appendix E (Table E-1) rather than in the body of this report. Briefly, no statistically significant coefficients were obtained for the instructional cost of reading programs. For math, the results were similar, with the exception of four significant, but very small, coefficients.

Caution is necessary in the interpretation of these results. In Chapter 3 we noted that there is a tendency for lower-achieving students to receive programs using more costly resources. This allocation effect was reported by Sumner et al. (1979) in their analysis of school-year cost/effectiveness and appears to occur in summer school as well. This effect can be seen in Table 5-3 which presents the zero-order correlations of the costs of summer program instructional resources, the spring pretest and the fall posttest. Generally, the correlations indicate that students with lower pretests are offered more costly programs in reading and math.

In addition to the regressions presented, models specifiying a second-order term as well as the first-order term for program cost were applied. This approach was taken to allow any diminishing returns to program costs to become manifest. Because the addition of the second-order term failed to increase the fit of the regression models, we do not report the results.

The results of parallel regression models that subset the student sample on the basis of

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*The appropriateness of regression models that allow pretest scores to control for the influence of other unspecified variables was explored in the previous chapter.

Table 5-2

Proportion of Reading and Math Posttest Variance Accounted for by Pretest and Summer Cost of Instructional Resources, by CE Selection Category for Five Cohorts

Selection Category	Proportion of Posttest Variance Accounted for by Pretest	Proportion of Posttest Variance Accounted for by Summer Program Cost	R^2
		Reading	
Cohort 1-2	.6233	.0007	.6285
Title I	.5293	.0040	.5303
Other-CE	.5729	.0045	.5936
Non-CE	.6475	.0021	.6680
Cohort 2-3	.6311	.0001	.6312
Title I	.5679	.0021	.5726
Other-CE	.6061	.0015	.6073
Non-CE	.6236	.0029	.6243
Cohort 3-4	.6657	.0004	.6660
Title I	.5389	.0014	.5429
Other-CE	.5940	.0003	.5954
Non-CE	.6127	.0027	.6147
Cohort 4-5	.6347	.0001	.6828
Title I	.5024	.0036	.5457
Other-CE	.4411	.0012	.4749
Non-CE	.6244	.0006	.6953
Cohort 5-6	.7456	.0001	.7575
Title I	.4705	.0003	.4786
Other-CE	.7419	.0003	.7986
Non-CE	.8008	.0006	.8251
		Math	
Cohort 1-2	.5132	.0029	.5132
Title I	.5509	.0002	.5551
Other-CE	.3670	.0113	.3673
Non-CE	.5189	.0001	.5253
Cohort 2-3	.5671	.0059	.5684
Title I	.4827	.0051	.4829
Other-CE	.5933	.0005	.5941
Non-CE	.5646	.0106	.5693
Cohort 3-4	.6341	.0005	.6347
Title I	.4607	.0143	.5448
Other-CE	.6089	.0025	.6109
Non-CE	.6922	.0113	.6936
Cohort 4-5	.6622	.0003	.6657
Title I	.6209	.0019	.6217
Other-CE	.6506	.0018	.6743
Non-CE	.6248	.0000	.6404
Cohort 5-6	.6074	.0000	.6078
Title I	.3870	.0083	.3929
Other-CE	.6281	.0035	.6287
Non-CE	.5970	.0001	.6020

Table 5-3

Zero-Order Correlations of the Cost of Summer Program's Resource Use and Spring Pretest and Fall Posttest for Five Cohorts of Summer School Attendees, by CE-Selection Categories for Reading and Math

Selection Category	Reading			Math		
	N	Pretest	Posttest	N	Pretest	Posttest
Cohort 1-2 (Total)	584	–.12	–.07	523	–.07	.00
Title I	233	–.04	.03	143	–.11	–.07
Other-CE	123	.10	.14	102	–.20	–.02
Non-CE	228	–.23	–.14	278	–.09	–.08
Cohort 2-3 (Total)	592	.02	–.01	489	–.05	.04
Title I	219	.03	.07	115	–.08	.01
Other-CE	145	.09	.03	118	–.07	–.03
Non-CE	228	–.10	–.03	256	–.05	.07
Cohort 3-4 (Total)	512	–.05	–.02	422	–.06	–.02
Title I	226	.04	.06	154	–.24	–.29
Other-CE	119	.07	.04	101	.01	–.05
Non-CE	167	–.12	–.04	167	–.17	–.04
Cohort 4-5 (Total)	448	–.27	–.22	403	–.09	–.06
Title I	169	–.36	–.21	146	–.09	–.03
Other-CE	80	.22	.18	62	.14	.15
Non-CE	199	–.29	–.27	195	–.15	–.12
Cohort 5-6 (Total)	335	–.14	–.11	314	–.03	–.02
Title I	139	–.10	–.09	106	.02	–.08
Other-CE	53	–.29	–.24	54	–.04	.03
Non-CE	143	–.20	–.16	154	–.10	–.07

pre-summer achievement status were similar to those discussed above for the sample analyzed on the basis of CE selection categories. As such, those regressions (blocked on achievement status) are not formally discussed in this chapter but, rather, are given in Appendix E. Generally, the results are not surprising, since the summer-study sample is, in itself, somewhat "self-stratifying" on achievement by virtue the relatively low achievement levels of summer-school attendees in general, as compared to those of students who do not attend summer school.

What Combinations of Resources (Program Components) Are More Cost/Effective in Increasing Achievement Growth?

The analyses undertaken for this question are similar to those discussed under the preceding question. In this question, however, we shift focus from the total cost of instructional resources used in summer programs in reading and math to a consideration of the possible cost/effectiveness of alternative combinations of resources that comprise summer programs. In doing so, we substitute the program component costs described in Chapter 3 as the predictors in the regressions.

The program components were collapsed into four categories: group instruction by regular teachers, individualized instruction by regular teachers, special-teacher instruction, and teaching assistance by an aide or volunteer tutor. The zero-order correlations of these categories with both pretest and posttest are shown in Table 5-4. The correlations of pretest and the various groupings of components for cohorts as a whole indicate that there is again some tendency for more costly programs to be allocated to students with lower pretest scores.

Table 5-4

Zero-Order Correlations of Program Component Costs (Collapsed) With Pretest and Posttest Scores for Five Cohorts of Summer School Attendees

	Group Instruction	Individualized Instruction	Special Teacher Instruction	Aide or Tutor
		Reading		
Cohort 1-2				
Pretest	.01	−.21	.15	−.09
Posttest	.07	−.19	.16	−.03
Cohort 2-3				
Pretest	.08	−.03	.01	−.10
Posttest	.15	−.03	.01	−.08
Cohort 3-4				
Pretest	.13	−.02	−.08	−.12
Posttest	.14	.00	−.06	−.12
Cohort 4-5				
Pretest	−.09	−.19	−.07	−.21
Posttest	−.02	−.15	−.11	−.17
Cohort 5-6				
Pretest	.02	−.16	.07	−.09
Posttest	−.03	−.16	.07	−.10
		Math		
Cohort 1-2				
Pretest	−.05	−.14	.11	.05
Posttest	.09	−.10	.10	.00
Cohort 2-3				
Pretest	.15	−.09	−.04	.00
Posttest	.19	−.00	−.04	−.02
Cohort 3-4				
Pretest	.13	−.11	.02	.00
Posttest	.16	−.10	.03	.01
Cohort 4-5				
Pretest	.07	−.07	−.06	.01
Posttest	.11	−.06	−.02	−.01
Cohort 5-6				
Pretest	.22	−.11	.00	.02
Posttest	.23	−.03	−.09	.03

The allocation effect can be seen in the consistently negative correlations between pretest score and the costs of individualized instruction by regular teachers. Because the incidence of instruction by special teachers is not frequent in summer school (see Chapter 3), the program components collapsed into the individualized instruction category represent the more cost-intensive instructional treatments found in summer school.

Given the negative relationship between pretest and cost, it is not surprising that most of the handful of small but statistically significant regression coefficients of the cost variables (displayed in Tables 5-5 and 5-6) are associated with the group-instruction category. The components that enter the group-instruction categories are, by definition, less labor intensive and generally less costly than those comprising individualized instruction.

Generally, the use of the program component costs does not much improve the overall fits of the regressions (as indexed by a comparison of the respective R^2 values) as compared to those obtained with total cost and pretest as the explanatory variables.

Since these regressions contained five independent variables we did not calculate the unique proportions of posttest variance explained by each independent variable. Inspection of the simple correlations of the four cost categories with posttest scores (Table 5-4) indicates that little posttest variance is associated with the costs.

As a whole, the regressions of achievement growth on the cost of the program components do not provide strong support for the differential cost/effectiveness of alternative combinations of resources.

What Are the Relative Costs and Effectiveness Measures of Summer School As Compared to Academic-Year Programs?

The analysis of this question involved establishing a reasonable basis for comparing summer programs to school-year programs. In order to accomplish this, we calculated the amount of achievement gain obtained (in vertical-scale points) by various subsets of students during the school year and over the summer. We also computed the ratio of hours of instruction in reading and math during the summer to the hours received during the preceding school year. We further computed a ratio of total program cost (reading and math separately) during the summer to that of the school year.

Because the results of other analyses that indicated a lack of association between the cost of the resources used in summer programs to student achievement (a result similar to that reported for school-year programs in Technical Report #7) and the general conclusion that summer programs are not effective (based on the regression analyses using a dummy variable to represent attendance at summer school), we decided not to report the results of the planned analysis of the relative cost/effectiveness of summer and school-year programs. From preliminary analyses, it became clear to us that the analysis would provide very misleading results. An additional concern leading to the decision to forego the reporting of relative cost/effectiveness is the simple fact that summer programs are not a true alternative to school-year programs, and therefore one ought not to make such comparisons of cost/effectiveness between the programs.

At What Grade Levels Are Summer Programs More Cost/Effective?

Considering the regressions against total program cost, we may point out that the regression analyses reported thus far in this chapter, as well as those discussed in Chapter 4, provide little indication that summer programs are differentially cost/effective (or effective) at different grade levels.

Table 5-5

Regression Coeffcients for the Cost of Reading Program Components (Collapsed), by CE Selection Category for Five Cohorts of Summer School Attendees

Selection Category	Group Instruction	Individualized Instruction	Special Teacher Instruction	Aid or Tutor	Pretest	R^2
Cohort 1-2 (Total)						
	.91*	−.04	.18	.24	.90**	.64
	(.37)	(.07)	(.10)	(.32)	(.03)	
Title I	2.76**	−.07	.19	−.23	.70**	.56
	(.80)	(.10)	(.15)	(.45)	(.05)	
Other-CE	1.11	.05	−.27	−.40	.86**	.60
	(1.06)	(.15)	(.72)	(1.46)	(.07)	
Non-CE	.52	.10	.25	.90	1.03**	.67
	(.50)	(.12)	(.16)	(.65)	(.05)	
Cohort 2-3 (Total)						
	1.19**	−.03	.01	−.48	.80**	.64
	(.35)	(.07)	(.11)	(.42)	(.03)	
Title I	.93	.06	.09	.17	.71**	.58
	(.61)	(.09)	(.16)	(.60)	(.04)	
Other-CE	.03	−.12	−.01	−.10	.74**	.61
	(.81)	(.15)	(.24)	(1.01)	(.05)	
Non-CE	2.18**	.08	.38	−.48	.89**	.65
	(.54)	(.11)	(.22)	(.87)	(.05)	
Cohort 3-4 (Total)						
	.70	.05	.13	−.60	.90**	.67
	(.42)	(.07)	(.21)	(.45)	(.03)	
Title I	.05	.00	.02	.68	.78**	.55
	(.72)	(.13)	(.27)	(.56)	(.05)	
Other-CE	−.56	.00	−.23	−.78	.84**	.60
	(.85)	(.15)	(.41)	(1.15)	(.07)	
Non-CE	1.84*	.11	.91	−2.56*	.88**	.63
	(.74)	(.11)	(.52)	(1.19)	(.05)	
Cohort 4-5 (Total)						
	.37	.04	−.49	.03	.84**	.69
	(.26)	(.11)	(.28)	(.76)	(.03)	
Title I	.26	.13	−.27	.94	.77**	.55
	(.37)	(.18)	(.48)	(1.29)	(.06)	
Other-CE	.03	.22	−.68	.41	.62**	.51
	(.55)	(.42)	(.54)	(1.90)	(.08)	
Non-CE	.74	−.13	.09	−1.12	.83**	.70
	(.51)	(.14)	(.49)	(1.11)	(.04)	
Cohort 5-6 (Total)						
	−.36	−.08	.11**	−.54	.92**	.76
	(.23)	(.09)	(.02)	(.56)	(.03)	
Title I	−.60	.22	1.21	−2.13	.78**	.52
	(.36)	(.19)	(.82)	(1.18)	(.07)	
Other-CE	.06	−.24	−.37	1.36	.93**	.80
	(.93)	(.44)	(.78)	(1.16)	(.07)	
Non-CE	.17	.07	−.01	.52	.94**	.83
	(.34)	(.10)	(.20)	(.99)	(.04)	

Standard errors in parentheses.
* $P < .05$
** $P < .01$

Table 5-6

Regression Coeffcients for the Cost of Reading Program Components (Collapsed), by CE Selection Category for Five Cohorts of Summer School Attendees

Selection Category	Group Instruction	Individualized Instruction	Special Teacher Instruction	Aid or Tutor	Pretest	R^2
Cohort 1-2 (Total)						
	1.85**	.09	.35	−.22	.74**	.53
	(.42)	(.14)	(.22)	(.63)	(.03)	
Title I	.91	.12	−1.37	−.92	.68**	.56
	(.94)	(.27)	(1.35)	(1.21)	(.05)	
Other-CE	2.50**	.29	1.49	−.31	.68**	.44
	(.74)	(.31)	(1.41)	(1.32)	(.08)	
Non-CE	.98	−.13	.034	−.11	.78**	.53
	(.71)	(.21)	(.28)	(1.01)	(.05)	
Cohort 2-3 (Total)						
	1.10**	.39**	.27	−.54	.78**	.57
	(.40)	(.15)	(.25)	(.55)	(.03)	
Title I	.90	.19	.40	−.45	.67**	.48
	(1.44)	(.40)	(.51)	(2.43)	(.07)	
Other-CE	.30	.22	.07	−.81	.88**	.60
	(.83)	(.36)	(.95)	(1.06)	(.07)	
Non-CE	1.76**	.53**	.46	−.35	.79**	.58
	(.60)	(.19)	(.32)	(.84)	(.05)	
Cohort 3-4 (Total)						
	1.12**	.07	.25	.24	.89**	.64
	(.48)	(.16)	(.24)	(.65)	(.03)	
Title I	−2.18	−.73*	−.96	1.08	.72**	.55
	(1.29)	(.32)	(.68)	(1.69)	(.06)	
Other-CE	.51	−.44	.21	.13	1.03**	.62
	(1.16)	(.39)	(.58)	(1.53)	(.09)	
Non-CE	1.92**	.50*	.66	.87	.92**	.71
	(.58)	(.21)	(.30)	(.88)	(.05)	
Cohort 4-5 (Total)						
	1.50*	.07	.31	−.31	.84**	.67
	(.68)	(.12)	(.22)	(.71)	(.03)	
Title I	3.12*	.29	.32	−.52	.84**	.63
	(1.41)	(.20)	(.43)	(1.89)	(.06)	
Other-CE	.74	.23	.69	.63	.74**	.69
	(2.15)	(.27)	(.62)	(1.99)	(.07)	
Non-CE	.98	.09	.52	.070	.84**	.65
	(.99)	(.25)	(.41)	(1.16)	(.05)	
Cohort 5-6 (Total)						
	.87	.21	−.55	.46	.82**	.62
	(.78)	(.24)	(.30)	(.82)	(.04)	
Title I	−.013	−.19	−.71	−.055	.75**	40
	(2.03)	(.50)	(.53)	(1.67)	(.10)	
Other-CE	−2.88	.54	−.77	2.94	.99**	.66
	(2.39)	(.76)	(1.10)	(2.14)	(.11)	
Non-CE	1.45	.21	−.30	−.18	.73**	.67
	(.86)	(.28)	(.37)	(1.11)	(.05)	

Standard errors in parentheses.

* $P < .05$

** $P < .01$

SUMMARY

The research reported in this chapter was directed toward three policy questions. The first question was concerned with the possible existence of relationships between the cost (resources) of summer programs and growth in student achievement. The second question extended that basic cost/effectiveness analysis to a consideration of possible differences in the cost/effectiveness relationship associated with alternative combinations of resources (as represented by four groupings of the program component costs). A comparison of the relative cost/effectiveness of summer and school-year programs was the final policy issue to be investigated.

The regression analysis that examined the association of summer program cost and achievement growth revealed little relationship between the two variables. It was also found, however, that the cost of instructional resources used in summer programs, in both reading and math are usually higher for students with lower pretest scores. A similar lack of relationship between cost and achievement was the case in the analysis of the cost of program components as well.

Overall, then, the cost/effectiveness results confirm a lack of effect associated with summer programs described in the preceding chapter. Again, we remind the reader that summer programs are not particularly intensive treatments from which one would expect much effectiveness and/or cost/effectiveness.

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APPENDIX A

THE 1976 SUMMER STUDY FEASIBILITY SURVEY

In the Summer of 1976, a telephone survey of the principals of the SES schools was made to obtain information on the availability of summer school for the SES students. The information provided the basis for determining the feasibility of conducting a summer-school study in the Summer of 1977. In addition, the data collected were designed to permit an assessment of alternative logistics for efficient data collection.

The Summer Study Feasibility Survey Report, (Al-Salam, Haggart, and Klibanoff, 1977), prepared in March of 1977, summarized the results of the survey and discussed the impact of the findings on the design of the summer study. In this appendix we provide a brief discussion of some of the results of the survey.

BRIEF SUMMARY OF FINDINGS

The feasibility survey revealed that in 1976 summer school was available to students in 45 percent of the SES schools. Twenty percent of the SES schools operated summer programs on the physical premises of the sample schools themselves. For students at another 25 percent of the SES schools, summer programs were available at other schools that were not part of the sample.

Most of the SES summer students attended programs operated by the sample school itself (SS); these programs served the SES students and possibly students from other nearby schools. The rest of the summer programs available to SES students were held at another school (AS) in the sample school's district. Sometimes more than one AS program was available to a district's SES students; for example, one AS program might serve grades 1-3 and the other grades 4-6, or one program might offer reading instruction and another math instruction. Thus, students from one SES school might be distributed among several different AS locations.

The survey revealed that the number of SES students participating in summer programs at the SES schools themselves (5,900) was three times greater than that of students attending summer school at other locations (1,900). It was found that, in 1976, roughly 8 percent of the estimated 106,000 SES students attended summer schools. The large majority (73 percent) of SES students attending summer school did so at SS programs, while the remaining 27 percent attended AS programs.

Most summer school programs do not serve the students from only one school; even if a summer program is organized with the expectation that only students from that particular school will participate, students from other attendance areas usually attend as well. Thus, an interesting feature of the information collected in the survey was the proportion of SES students to the total enrollment of a summer school. In SS programs, an average of 71 percent of the students enrolled were SES students, i.e., students who attended the sample school during the previous school year. In AS programs, the average proportion of SES students enrolled was much lower—19 percent.

An important consideration to a data collection plan was the distribution of students and teachers in summer schools according to the "locus" of the program (SS or AS) and the "size" of the program (number of SES students in attendance). Both of these variables had a great impact on the operational configuration of the 1977 summer study. Many more AS programs than SS programs would have to have been included in the sample to secure information on the same number of students.

In the SS programs, there were 322 teachers who taught reading and 300 who taught math; in the 10 larger AS programs, the corresponding numbers were 115 and 118. The SES students in AS programs, comprising a smaller portion of the total enrollment, were distributed among the larger number of teachers. Therefore, the efficiency of data collection at the SS programs would, on the average, be greater than at the AS programs. Obtaining classroom data from 322 SS reading teachers provides the program information for 5,228 SES students; in contrast, 115 teachers in the 10 largest AS summer programs would provide data for only 492 SES students. The magnitude of this difference, when coupled with the fact that some teachers and the SES coordinator would know the SES data collection procedures, argued for including only summer schools held in SES schools.

The survey also provided the information necessary to design the instrumentation for the operational summer study. It was determined that (1) existing regular year SES instrumentation, including selected data from the Summer Activity Slipsheet, the Compensatory Education Roster, and the Student Background Checklist could be used; (2) two summer instruments could be designed drawing on selected items from the regular year SES Principal Questionnaire, Section B, and the Teacher Questionnaires, Sections A, B, and C; (3) operational devices for linking students to specific teachers and for recording attendance were developed specifically for the summer study. These intruments are published in Technical Report #9A (Staff of the SES, 1979).

APPENDIX B

SUMMER RESOURCE COST MODEL

This appendix provides a brief description of the summer resource cost model (SRCM) used to estimate the reading and math program costs for each student in the summer study. The model is similar to the resource cost model used in estimating student-level program costs for RMC's earlier resource and cost/effectiveness analyses. (See Haggart, S.A.; Klibanoff, L.S.; Sumner, G.C.; and Williams, R.S., 1978.)

One difference lies in the integration of the processing of the summer study's basic data sources—the Summer Principal Questionnaire (SPQ), the Summer Teacher Questionnaire (STQ), the Summer Compensatory Education and Attendance Record (SCEAR), and the Student Teacher Linkage Roster (STLR). A major difference, however, is the model's use of the teachers' descriptions of how instruction is provided within the classroom rather than the student-level measures of resource exposure provided by the regular-year SES instruments.

The conceptual basis of the model used to generate the cost (C) of a student's instructional program for reading or math is:

$C = P * Q$
Where $P =$ price per unit of resource use
$Q =$ the quantity of use of the resource

In order to operationalize this basic model, the quantity factor (Q) must be adjusted for two additional factors, such that the model is rewritten as:

$C = P * Q * L * S$
Where $L =$ a *length* factor that adjusts all cost to the cost per summer session
$S =$ a *size* factor that distributes shared resources from the class level to the student level

The inputs to the model are of two types: (1) those that measure the quantity (Q) of the resources used, and (2) those that give a price per unit (P) of the resources. The questionnaire item responses on resource-use provide the Q inputs, and the unit price of resources developed through the adjusted algorithms for regular-year pricing provide the P inputs. The operation of the model multiplies the quantities of resource-use by the prices per unit of resource-use and sums or apportions these products to achieve the values of variables associated with the individual student's programs. These variables, the model outputs, are the cost and hours by type of resource and by program component.

The STQ provides data on student exposure to classroom teachers, special teachers, teaching assistants/aides and tutors (student or adult volunteer), measured at the classroom level. The quantities of equipment and materials are also measured at the classroom level.

Because the differential treatment of students within an instructional unit (classroom or reading/math period) was not likely to be great, the STQ included items designed to identify inter-classroom rather than intra-classroom variations in the treatment of summer sudents. The instrument was a combination of items selected from the regular-year SPAR (Student Participation and Attendance Record) and the Teacher Questionnaire, Sections A, B, and C. It was short (in terms of number of items) and designed to be self-administered by the summer school teachers. The STQ included items to measure the length of the instructional time (reading and/or math) of each teacher's general instructional program. The STQ was completed by all summer-school teachers who provided instruction in reading or math.

The SPQ was used to obtain information on characteristics that create distinctions among summer schools. For the model, the SPQ provided information about the number of days in the summer school and instructional hours per day. Information about school-wide coordination of instruction, general instructional practices of the school, enrollment restrictions, and the sources of CE funding were also obtained on the SPQ but for descriptive purposes only.

The Summer Student/Teacher Linkage Roster (S/TLR) was developed for the purpose of establishing student-teacher linkages by ID numbers. The Summer Compensatory Education and Attendance Record (SCEAR) was used to record each student's summer school attendance information. The S/TLR and the SCEAR were completed through the joint effort of the coordinator of the summer school and the teachers. The data from these instruments provide information on the quantity (Q) of the major inputs used in estimating the instructional program cost.

Pricing algorithms used in the regular year RCM were adjusted for the summer school items and are used to generate the standard prices (P). The standard prices that result from the algorithms were either the prices of single units of resources—teacher salary—or the price related to the level of use for a particular type of resource—the use of sound equipment once a week. Different pricing algorithms were used to develop the prices for teaching staff salaries, equipment, materials, and direct instructional support—the teaching assistants. For the analyses of the cost and outcome, a constant salary for all teachers was used in the SRCM. This usage was based on the rationale that it is unfair to expect those students who happened to be assigned to a teacher with, for example, twenty years of experience, to achieve more than those students assigned to a less experienced teacher.

Five subprograms (S100 to S500) comprise the SRCM. The purpose and nature of the five subprograms are briefly described.

- *Subprogram S100.* Generates records on the basis of the Summer Student-Teacher Linkage Roster (STLR) that can be matched by teacher ID number against the Summer Teacher Score File. For each teacher specified on the STLR, a teacher linkage record is created.

  Inputs: Summer Student-Teacher Linkage Roster File

  Output: Teacher Linkage File

- *Subprogram S200.* Obtains teacher information relating to individual students. The

Teacher Linkage File and the Summer Teacher Score File are matched on school and teacher ID numbers.

Inputs: Teacher Linkage File and Summer Teacher Score File

Output: Student-Teacher File

- *Subprogram S300.* Generates a file (CEARPR) combining information contained in the Summer Compensatory Education and Attendance Record (SCEAR) and in the Summer Principal Questionnaire. Input files are matched on school ID numbers; for each match a SCEARPR record is created.

Inputs: SCEAR File and Principal File

Output: Combined SCEAR and Principal File—SCEARPR File

- *Subprogram S400.* Combines information from the SPARMPR file of Subprogram S300 and the student-teacher linkage file of Subprogram S200. Produces a student resource record.

Inputs: SPARMPR File and Student-Teacher Linkage File

Output: Student Resource Record File

- *Subprogram S500.* Creates the Resource-Program file from the student resource record. Incorporates the standard salary schedule matrix, other prices and the adjustment factors of quantity, length, size and time.

Inputs: Student Resource Record File

Output: Reading and Math Resource-Program File

APPENDIX C

SUPPORTING TABLES FOR CHAPTER 3

Table C-1

Mean Cost of Reading Resources Used, Hours of Instruction, and Cost-Per-Hour of Instruction, by Selected Student Characteristics

Student Characteristics (During Regular School Year)	Cohort 1-2				Cohort 2-3				Cohort 3-4				Cohort 4-5				Cohort 5-6			
	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour
CE Selection Category																				
Title I	235	32.48	16.96	1.92	220	31.12	17.19	1.81	230	27.51	15.23	1.81	170	25.78	15.59	1.65	143	28.47	17.42	1.63
Other CE	124	32.66	18.31	1.78	149	31.18	19.73	1.58	126	28.93	18.91	1.53	81	31.39	21.17	1.48	53	35.67	16.73	2.13
Non-CE	230	24.70	16.65	1.48	229	27.11	17.52	1.55	169	24.73	15.47	1.60	203	23.83	15.20	1.57	144	30.09	20.06	1.50
Teacher Judgment																				
CE Needed	330	32.92	18.06	1.82	388	29.35	17.36	1.69	358	28.27	16.36	1.73	289	27.36	17.00	1.61	221	33.48	19.84	1.69
CE Not Needed	250	25.18	16.00	1.57	207	30.04	19.08	1.57	166	24.25	15.88	1.53	164	23.48	15.47	1.52	116	24.47	15.84	1.54
Student Status																				
Minority	318	31.33	17.81	1.76	329	29.02	17.23	1.68	325	24.91	15.10	1.65	294	27.00	16.85	1.60	240	31.54	18.91	1.67
Non-Minority	262	27.46	16.40	1.67	266	30.30	18.87	1.61	199	30.41	18.01	1.69	159	24.02	15.69	1.53	97	27.50	17.36	1.58
Free Lunch																				
Participant	319	30.46	16.96	1.80	321	28.63	17.13	1.67	329	27.11	16.03	1.69	302	27.76	16.95	1.64	235	33.10	18.99	1.74
Non-Participant	261	28.51	17.43	1.64	274	30.71	18.94	1.62	195	26.81	16.50	1.62	151	22.34	15.43	1.45	102	24.11	17.26	1.40
Spring Achievement																				
Lowest Quarter	244	32.59	17.75	1.84	272	30.16	16.92	1.78	262	27.36	16.09	1.70	230	29.28	18.03	1.62	168	31.40	17.64	1.78
2nd Quarter	166	29.30	16.89	1.73	179	31.04	19.43	1.60	133	30.35	17.26	1.76	126	26.09	15.89	1.64	94	34.16	22.15	1.54
3rd Quarter	127	25.26	16.09	1.57	116	27.70	18.07	1.53	74	23.24	16.05	1.45	57	18.64	14.14	1.32	50	24.74	16.41	1.51
Highest Quarter	52	25.80	17.49	1.48	31	23.45	17.97	1.30	56	21.91	14.32	1.53	41	16.60	12.09	1.37	28	20.38	14.27	1.43

Table C-2

Mean Cost of Math Resources Used, Hours of Instruction, and Cost-Per-Hour of Instruction by Selected Student Characteristics

Student Characteristics (During Regular School Year)	Cohort 1-2				Cohort 2-3				Cohort 3-4				Cohort 4-5				Cohort 5-6			
	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour	N	Cost	Hours	Cost/ Hour
CE Selection Category																				
Title I	147	12.53	8.02	1.56	115	19.86	14.48	1.37	159	15.52	10.76	1.44	150	21.81	14.15	1.54	108	19.00	12.16	1.56
Other CE	105	24.43	15.06	1.62	122	21.98	14.05	1.56	101	19.24	13.22	1.46	62	34.11	18.20	1.87	56	26.94	15.85	1.70
Non-CE	279	18.93	13.35	1.42	259	20.65	15.78	1.31	168	22.99	16.00	1.43	203	19.11	14.24	1.34	156	20.28	13.69	1.48
Teacher Judgment																				
CE Needed	288	17.91	11.49	1.56	308	19.93	13.64	1.46	292	18.92	13.08	1.45	257	23.74	15.30	1.55	202	22.17	13.43	1.65
CE Not Needed	236	18.50	13.02	1.42	185	22.00	17.31	1.27	136	20.21	14.07	1.44	157	20.11	14.07	1.43	116	19.08	13.77	1.39
Student Status																				
Minority	291	17.33	11.45	1.51	274	21.04	14.77	1.42	272	16.46	11.77	1.40	259	22.50	14.21	1.58	215	20.10	12.52	1.61
Non-Minority	233	19.24	13.08	1.47	219	20.30	15.32	1.33	156	24.34	16.26	1.50	155	22.13	15.87	1.39	103	23.00	15.72	1.46
Free Lunch																				
Participant	297	17.74	11.34	1.56	273	21.31	14.28	1.49	278	17.94	12.66	1.42	272	22.93	14.21	1.61	216	21.50	12.97	1.66
Non-Participant	227	18.75	13.27	1.41	220	19.96	15.93	1.25	150	21.92	14.76	1.49	142	21.28	16.03	1.33	102	20.08	14.79	1.36
Spring Achievement																				
Lowest Quarter	187	19.20	12.04	1.59	191	21.45	13.90	1.54	184	20.83	13.86	1.50	174	23.37	14.11	1.66	131	21.16	13.10	1.62
2nd Quarter	150	18.78	12.41	1.51	144	20.48	15.61	1.31	107	18.17	12.84	1.42	123	24.69	16.53	1.49	93	22.35	14.12	1.58
3rd Quarter	89	17.54	13.05	1.34	93	20.11	15.75	1.28	96	19.01	13.44	1.41	67	20.35	13.87	1.47	56	19.36	13.46	1.44
Highest Quarter	105	16.93	11.54	1.42	68	20.54	16.16	1.27	41	16.40	12.66	1.30	51	15.66	11.80	1.33	40	19.73	13.84	1.43

APPENDIX D

SUPPORTING TABLES FOR CHAPTER 4

Supporting tables for the material discussed in Chapter 4 are provided in this appendix. Table D-1 displays average achievement test scores in combination with 1976-77 CE-selection status (six categories) and 1976-77 reading or math achievement status (expressed as quarters of the achievement distribution; Q_1, being the lowest quarter and Q_4 the highest) based on the average of fall and spring percentile ranks. Tables D-2 to D-11 display similar data separately for students who attended summer school and those who did not.

Table D-12 displays Summer growth data for Title I students stratified into four groups as based on their individual school-year achievement gains.

Tables D-13 and D-14 provide summer growth data for students grouped on the basis of their school-year gains for the other five CE-selection categories and a special comparison group. The tables present the results separately for summer school attendees and non-attendees.

The final group of tables provide selected results based on a semi-longitudinal sample (all students present in the Fall of 1977 who were present at one or both of the test administrations in the 1976-1977 school year). Table D-15 gives the achievement results for full cohorts of students. Table D-16 gives similar data for Title I students. Tables D-17 and D-18 provide the results of regression analyses including students missing certain family background indicators (please see text of Chapter 4).

Table D-1

Achievement Results (VSS) for Three Test Occasions By Four Quarters of 1976-77 Achievement Status and CE Selection Category—Reading and Math—Longitudinal

Cohort 1-2

Reading

CE Status Student/School*		Q1 X	Q1 S.D.	Q2 X	Q2 S.D.	Q3 X	Q3 S.D.	Q4 X	Q4 S.D.	N's Q1	N's Q2	N's Q3	N's Q4
Fall, 1976													
Title I/TI	1.	302.71	18.90	333.31	16.05	354.24	18.77	380.43	14.53	788	506	231	58
OCE/TI	2.	311.18	17.76	334.88	14.08	358.32	15.24	385.36	14.98	182	157	103	44
OCE/OCE	3.	303.00	21.67	336.13	15.11	366.88	18.05	392.10	13.83	91	77	34	10
NCE/TI	4.	306.00	20.34	334.45	15.98	357.00	16.86	386.01	15.12	660	1061	1035	760
NCE/OCE	5.	307.30	17.28	336.18	15.70	360.67	16.57	387.63	13.85	194	388	479	510
NCE/NCE	6.	301.69	20.63	331.84	14.55	359.21	17.16	386.87	15.04	255	294	296	199
Spring, 1977													
Title I/TI	1.	355.48	27.90	395.67	22.72	429.02	22.96	461.62	20.20				
OCE/TI	2.	354.43	26.34	394.62	23.38	426.14	19.85	460.07	19.92				
OCE/OCE	3.	354.66	28.37	390.04	22.19	418.00	15.48	485.20	50.67				
NCE/TI	4.	359.79	27.62	398.59	20.79	428.57	20.40	468.01	26.49				
NCE/OCE	5.	363.80	27.28	396.27	20.90	425.60	18.76	466.32	28.30				
NCE/NCE	6.	354.43	33.82	401.47	18.91	424.57	20.04	460.11	21.30				
Fall, 1977													
Title I/TI	1.	361.05	29.96	397.16	30.03	435.17	27.51	461.15	25.27				
OCE/TI	2.	364.09	30.66	402.17	27.52	438.81	25.34	462.55	21.67				
OCE/OCE	3.	366.57	33.01	398.69	32.58	426.24	20.91	486.20	46.64				
NCE/TI	4.	372.95	31.31	407.34	29.04	440.65	27.26	476.55	28.87				
NCE/OCE	5.	377.31	29.27	404.91	30.21	440.42	29.78	477.33	31.11				
NCE/NCE	6.	364.13	33.43	407.94	8.40	433.58	30.12	472.93	34.83				

Math

CE Status Student/School*		Q1 X	Q1 S.D.	Q2 X	Q2 S.D.	Q3 X	Q3 S.D.	Q4 X	Q4 S.D.	N's Q1	N's Q2	N's Q3	N's Q4
Fall, 1976													
Title I/TI	1.	285.16	21.27	314.63	22.77	343.77	20.49	367.55	18.65	393	257	135	69
OCE/TI	2.	290.44	18.96	319.00	19.95	345.56	17.54	370.51	18.79	130	116	105	41
OCE/OCE	3.	289.96	17.22	320.19	15.67	341.83	18.40	374.27	18.78	50	26	18	11
NCE/TI	4.	291.30	19.43	319.86	17.32	342.89	16.58	374.47	19.95	973	1304	1203	853
NCE/OCE	5.	291.82	19.75	322.56	16.66	345.81	16.33	377.73	20.24	269	450	539	430
NCE/NCE	6.	285.09	24.64	320.32	17.52	349.36	17.94	377.36	19.26	255	316	269	200
Spring 1977													
Title I/TI	1.	339.52	25.87	381.11	25.35	413.76	25.44	455.01	22.51				
OCE/TI	2.	342.94	24.17	378.45	22.60	408.92	23.43	443.05	21.63				
OCE/OCE	3.	339.32	23.12	375.23	21.33	415.50	20.57	475.91	39.46				
NCE/TI	4.	339.79	24.97	380.35	21.30	412.88	21.66	451.72	25.22				
NCE/OCE	5.	344.70	21.79	378.56	20.92	409.70	20.45	449.04	25.23				
NCE/NCE	6.	334.58	31.50	380.35	21.16	407.16	20.38	444.70	22.98				
Fall, 1977													
Title I/TI	1.	346.95	32.15	376.05	31.14	404.83	31.48	430.04	34.71				
OCE/TI	2.	361.69	34.29	386.00	31.92	413.06	31.52	444.49	22.26				
OCE/OCE	3.	346.14	30.31	371.77	31.92	389.61	38.39	458.91	58.76				
NCE/TI	4.	353.56	32.82	385.39	29.38	414.63	29.70	449.10	31.24				
NCE/OCE	5.	355.70	32.04	384.06	29.39	414.64	30.14	446.30	30.51				
NCE/NCE	6.	350.20	37.78	388.30	30.72	411.33	28.83	445.85	36.93				

* Title I/TI stands for Title I Students during the regular school year in Title I schools; similarly OCE/TI stands for Other-CE Students in Title I schools; OCE/OCE stands for Other-CE Students in Other-CE Schools; NCE/TI stands for non-CE students in Title I schools; NCE/OCE stands for non-CE Students in other-CE schools, and NCE/NCE stands for non-CE Students in non-CE schools.

(Table D-1 Continued)

Cohort 2-3

CE Status Student/School*		Q1 X	Q1 S.D.	Q2 X	Q2 S.D.	Q3 X	Q3 S.D.	Q4 X	Q4 S.D.	N's Q1	N's Q2	N's Q3	N's Q4
					Reading								
					Fall, 1976								
Title I/TI	1.	356.79	27.07	398.17	18.85	425.90	19.52	466.11	22.67	920	480	159	47
OCE/TI	2.	362.06	30.34	404.59	15.57	433.85	19.21	468.40	17.09	170	128	85	52
OCE/OCE	3.	359.01	26.76	397.47	20.58	418.96	16.06	472.33	33.26	152	91	27	9
NCE/TI	4.	360.77	28.41	404.96	15.88	436.60	17.08	476.23	25.72	650	774	882	725
NCE/OCE	5.	364.33	23.52	404.72	19.57	436.70	18.46	484.21	26.79	146	328	473	489
NCE/NCE	6.	361.47	28.38	404.90	19.62	435.39	17.63	480.15	26.40	251	298	242	191
					Spring, 1977								
Title I/TI	1.	396.87	29.83	445.67	19.88	486.47	22.66	520.34	22.02				
OCE/TI	2.	399.69	30.33	444.06	20.34	479.78	19.70	523.67	18.26				
OCE/OCE	3.	398.66	32.91	444.59	22.26	492.07	20.03	520.67	22.48				
NCE/TI	4.	399.50	29.50	446.05	17.72	480.96	20.33	526.33	26.04				
NCE/OCE	5.	410.34	27.76	447.13	20.82	482.39	18.83	527.56	27.16				
NCE/NCE	6.	396.65	29.29	441.84	21.71	482.82	21.86	523.03	26.87				
					Fall, 1977								
Title I/TI	1.	402.43	33.30	448.18	29.35	480.56	32.13	518.19	38.39				
OCE/TI	2.	407.69	32.59	452.81	29.42	487.34	26.55	524.85	23.18				
OCE/OCE	3.	410.65	29.25	451.90	26.07	489.22	25.20	522.00	30.45				
NCE/TI	4.	407.14	34.29	453.83	27.30	491.38	26.40	528.81	29.98				
NCE/OCE	5.	423.23	28.45	456.16	31.19	493.86	26.69	536.57	34.14				
NCE/NCE	6.	409.38	29.40	447.67	26.07	488.77	30.50	531.35	36.32				

CE Status Student/School*		Q1 X	Q1 S.D.	Q2 X	Q2 S.D.	Q3 X	Q3 S.D.	Q4 X	Q4 S.D.	N's Q1	N's Q2	N's Q3	N's Q4
					Math								
					Fall, 1976								
Title I/TI	1.	335.87	28.34	376.32	22.65	411.00	21.55	448.43	24.25	468	255	106	35
OCE/TI	2.	338.93	25.31	379.07	19.36	411.96	23.27	451.30	22.76	119	102	74	57
OCE/OCE	3.	346.85	22.87	379.00	23.19	410.17	20.15	455.50	26.10	60	34	12	5
NCE/TI	4.	341.25	25.86	380.85	20.63	410.73	18.94	449.78	24.76	926	1122	1052	761
NCE/OCE	5.	346.90	22.39	381.01	20.17	411.75	17.29	453.71	26.77	238	430	507	423
NCE/NCE	6.	343.46	23.62	381.68	20.51	413.07	17.52	447.29	25.82	235	307	254	181
					Spring, 1977								
Title I/TI	1.	382.53	33.12	435.22	25.30	470.01	26.11	510.46	24.40				
OCE/TI	2.	392.45	30.55	434.92	18.82	468.49	26.99	510.39	24.17				
OCE/OCE	3.	383.13	30.18	433.62	28.60	466.50	18.19	513.00	31.17				
NCE/TI	4.	388.90	30.84	436.51	23.47	470.55	22.55	510.05	26.69				
NCE/OCE	5.	389.69	28.44	436.60	22.02	470.69	22.81	512.41	29.87				
NCE/NCE	6.	384.14	32.34	434.09	26.10	468.97	22.89	510.34	29.57				
					Fall, 1977								
Title I/TI	1.	393.58	38.41	431.78	32.72	467.06	30.67	514.71	39.98				
OCE/TI	2.	401.61	33.04	437.14	30.92	478.93	31.52	510.56	35.53				
OCE/OCE	3.	399.02	30.05	430.91	33.60	462.83	33.64	522.60	22.46				
NCE/TI	4.	395.43	33.38	435.94	30.50	465.94	30.11	503.69	34.12				
NCE/OCE	5.	403.52	37.52	438.91	29.40	470.81	29.64	507.65	35.75				
NCE/NCE	6.	401.09	36.41	435.65	31.04	463.24	29.75	498.70	34.54				

(Table D-1 Continued)

Cohort 3-4

CE Status		Q1		Q2		Q3		Q4		N's Q1	N's Q2	N's Q3	N's Q4
Student/ School*		X	S.D.	X	S.D.	X	S.D.	X	S.D.				
Reading **Fall, 1976**													
Title I/TI	1.	391.49	28.64	439.38	20.96	476.94	22.55	513.19	16.96	1023	457	139	27
OCE/TI	2.	396.01	27.34	444.59	19.21	481.80	25.29	527.63	24.77	202	145	76	49
OCE/OCE	3.	394.02	28.93	437.51	20.47	480.74	25.73	542.50	41.65	127	72	23	4
NCE/TI	4.	403.36	26.88	447.73	16.87	485.72	19.99	527.59	24.34	446	808	938	757
NCE/OCE	5.	407.45	24.98	445.26	19.16	485.62	20.37	535.27	32.84	168	349	495	498
NCE/NCE	6.	398.50	27.59	445.00	19.47	486.74	19.17	530.50	29.76	266	259	242	174
Spring, 1977													
Title I/TI	1.	426.07	28.00	480.77	20.15	517.85	17.58	548.19	19.49				
OCE/TI	2.	428.87	27.62	477.79	19.32	516.03	18.30	554.22	27.91				
OCE/OCE	3.	424.84	30.13	477.74	20.28	517.04	11.29	565.75	35.50				
NCE/TI	4.	432.27	26.07	480.88	18.37	516.41	17.63	560.38	30.37				
NCE/OCE	5.	437.35	17.02	482.34	18.83	517.91	16.29	573.23	35.50				
NCE/NCE	6.	431.70	28.18	478.60	21.44	516.40	16.86	566.94	33.55				
Fall, 1977													
Title I/TI	1.	426.78	32.87	479.10	29.08	514.46	28.60	565.48	44.75				
OCE/TI	2.	427.97	35.31	476.84	30.65	523.89	42.57	577.44	41.27				
OCE/OCE	3.	427.80	37.02	477.17	28.74	517.43	26.70	607.25	35.48				
NCE/TI	4.	437.85	32.20	489.14	25.60	528.86	29.61	579.51	37.63				
NCE/OCE	5.	444.11	29.32	490.50	27.31	529.53	27.40	587.59	38.67				
NCE/NCE	6.	436.85	33.22	485.95	30.43	528.85	29.18	586.90	39.96				

CE Status		Q1		Q2		Q3		Q4		N's Q1	N's Q2	N's Q3	N's Q4
Student/ School*		X	S.D.	X	S.D.	X	S.D.	X	S.D.				
Math **Fall, 1976**													
Title I/TI	1.	378.15	31.14	421.88	22.64	453.69	24.49	495.48	23.03	507	318	156	42
OCE/TI	2.	375.78	32.87	426.49	22.36	458.94	21.86	509.25	26.00	113	101	93	48
OCE/OCE	3.	383.98	30.25	431.23	17.60	464.00	18.16	499.40	27.55	57	39	20	5
NCE/TI	4.	387.16	28.71	432.21	20.82	462.80	22.76	505.22	26.23	755	1098	1069	756
NCE/OCE	5.	386.05	25.74	430.10	20.33	462.44	20.56	505.44	27.98	234	405	498	450
NCE/NCE	6.	386.52	27.43	428.96	19.49	462.38	21.17	502.03	30.17	234	277	249	184
Spring, 1977													
Title I/TI	1.	430.96	33.27	484.22	23.46	518.71	23.60	541.07	21.40				
OCE/TI	2.	429.45	38.58	483.27	21.87	516.11	19.45	539.56	20.96				
OCE/OCE	3.	419.75	37.18	485.41	26.73	528.00	23.36	540.00	32.24				
NCE/TI	4.	436.11	31.36	483.49	23.48	521.77	23.49	562.49	33.90				
NCE/OCE	5.	439.90	30.57	487.83	21.22	525.01	23.47	574.27	34.04				
NCE/NCE	6.	434.29	32.81	485.39	21.03	526.39	28.84	572.36	37.03				
Fall, 1977													
Title I/TI	1.	429.08	39.02	477.96	33.47	511.93	37.04	540.83	36.73				
OCE/TI	2.	436.49	41.95	485.46	33.02	516.28	32.38	560.79	46.35				
OCE/OCE	3.	422.53	33.48	474.87	39.23	518.80	27.90	544.20	37.29				
NCE/TI	4.	438.88	37.37	483.32	30.76	521.94	34.47	568.30	37.65				
NCE/OCE	5.	442.06	33.09	488.00	28.69	527.62	35.04	574.42	36.76				
NCE/NCE	6.	438.01	40.14	483.08	34.49	524.07	38.57	571.46	35.92				

(Table D-1 Continued)

Cohort 4-5

Reading

CE Status		Q1		Q2		Q3		Q4		N's Q1	N's Q2	N's Q3	N's Q4
Student/ School*		X	S.D.	X	S.D.	X	S.D.	X	S.D.				
Fall, 1976													
Title I/TI	1.	415.03	29.59	471.73	25.91	507.21	17.17	558.73	25.01	857	333	91	22
OCE/TI	2.	417.96	30.03	476.64	23.04	510.79	11.68	566.13	30.66	233	98	42	31
OCE/OCE	3.	413.56	29.96	466.36	27.38	508.27	21.92	576.14	29.68	113	58	33	7
NCE/TI	4.	422.87	31.17	479.78	19.81	516.08	15.90	572.77	33.08	577	936	931	705
NCE/OCE	5.	426.57	30.01	479.72	22.08	516.22	16.09	580.08	35.03	220	343	467	513
NCE/NCE	6.	420.48	28.94	480.16	18.67	515.44	17.44	576.15	35.69	254	269	238	184
Spring, 1977													
Title I/TI	1.	444.82	34.36	505.30	19.87	548.29	24.93	598.41	30.10				
OCE/TI	2.	441.81	36.93	506.89	22.51	546.74	21.60	608.61	28.63				
OCE/OCE	3.	449.60	35.38	507.24	19.42	547.55	21.66	627.14	39.92				
NCE/TI	4.	454.47	31.51	507.55	18.54	547.49	18.74	606.14	33.09				
NCE/OCE	5.	455.39	32.01	509.49	18.36	551.05	17.24	610.60	38.25				
NCE/NCE	6.	450.87	31.91	506.86	18.99	550.10	19.59	604.02	34.44				
Fall, 1977													
Title I/TI	1.	446.39	38.28	504.80	30.70	544.90	30.11	611.23	27.67				
OCE/TI	2.	454.23	34.99	512.13	25.52	546.50	24.70	608.48	36.89				
OCE/OCE	3.	450.04	39.58	506.84	32.28	542.42	30.39	630.43	41.93				
NCE/TI	4.	459.83	36.38	514.46	26.33	556.77	23.39	616.57	40.38				
NCE/OCE	5.	463.23	32.65	515.66	27.65	557.51	24.77	619.97	40.89				
NCE/NCE	6.	459.56	36.98	519.22	30.31	558.68	25.37	616.38	38.38				

Math

CE Status		Q1		Q2		Q3		Q4		N's Q1	N's Q2	N's Q3	N's Q4
Student/ School*		X	S.D.	X	S.D.	X	S.D.	X	S.D.				
Fall, 1976													
Title I/TI	1.	415.27	36.06	472.69	21.60	510.50	22.13	554.67	19.92	491	256	82	21
OCE/TI	2.	416.49	38.83	477.08	22.93	516.38	20.68	566.86	26.19	148	97	73	22
OCE/OCE	3.	420.35	30.96	480.07	29.54	518.93	25.99	567.14	28.53	54	27	15	7
NCE/TI	4.	425.09	32.43	480.14	20.40	518.68	24.03	573.64	30.77	853	1097	1021	736
NCE/OCE	5.	429.00	28.27	479.02	19.92	513.29	21.77	574.53	32.83	283	396	478	493
NCE/NCE	6.	426.76	32.92	478.82	21.38	512.96	22.12	569.40	29.20	208	272	251	173
Spring, 1977													
Title I/TI	1.	464.74	38.71	530.57	26.71	573.94	26.32	608.05	19.37				
OCE/TI	2.	453.33	41.11	531.76	23.66	572.44	22.90	609.09	20.49				
OCE/OCE	3.	459.83	38.10	530.48	23.67	561.93	30.71	614.14	18.03				
NCE/TI	4.	472.10	35.18	528.88	26.12	573.71	22.54	623.10	32.34				
NCE/OCE	5.	474.54	30.52	530.57	23.93	581.42	24.24	632.55	36.80				
NCE/NCE	6.	463.38	38.32	527.23	30.27	575.85	24.91	628.67	33.87				
Fall, 1977													
Title I/TI	1.	465.80	43.50	520.63	36.05	561.62	31.91	598.33	26.17				
OCE/TI	2.	463.04	44.72	528.82	33.93	574.19	33.49	619.41	38.22				
OCE/OCE	3.	465.39	31.80	524.33	37.42	546.33	37.79	593.14	31.31				
NCE/TI	4.	473.73	41.32	524.72	36.44	567.08	33.93	614.80	38.57				
NCE/OCE	5.	477.70	37.18	526.31	36.73	569.04	33.18	624.27	45.91				
NCE/NCE	6.	477.08	45.22	527.65	38.11	567.38	34.58	616.91	39.64				

(Table D-1 Continued)

CE Status Student/ School*		Q1 X	Q1 S.D.	Q2 X	Q2 S.D.	Q3 X	Q3 S.D.	Q4 X	Q4 S.D.	N's Q1	N's Q2	N's Q3	N's Q4	Q1 X	Q1 S.D.	Q2 X	Q2 S.D.	Q3 X	Q3 S.D.	Q4 X	Q4 S.D.	N's Q1	N's Q2	N's Q3	N's Q4
		Cohort 5-6																							
		Reading Fall, 1976												**Math Fall, 1976**											
Title I/TI	1.	440.64	33.52	502.05	19.13	541.79	14.35	593.09	24.12	727	255	61	23	458.29	36.22	515.27	24.60	561.42	24.62	610.00	20.15	441	226	77	14
OCE/TI	2.	441.82	39.35	508.13	16.16	548.31	19.98	602.45	40.00	106	86	29	20	453.99	40.83	524.49	27.55	568.70	17.97	611.43	20.31	94	69	57	30
OCE/OCE	3.	444.82	32.94	501.87	37.09	537.54	21.75	608.20	18.55	76	60	24	10	449.19	28.62	513.90	36.37	571.88	27.07	618.00	14.39	48	30	24	5
NCE/TI	4.	452.90	30.17	510.07	18.65	549.98	15.64	607.57	35.73	609	828	783	715	464.65	36.75	524.54	26.08	568.72	21.92	620.20	31.34	702	932	905	759
NCE/OCE	5.	451.61	29.06	511.93	20.03	550.08	16.81	608.11	35.45	270	413	439	502	466.80	30.86	521.56	25.66	569.13	23.39	625.62	34.26	318	423	502	467
NCE/NCE	6.	449.41	32.30	506.41	21.15	551.44	18.32	612.30	38.58	304	332	265	196	462.23	37.02	522.25	25.69	569.53	24.21	621.25	31.36	296	334	284	210
		Spring, 1977												**Spring, 1977**											
Title I/TI	1.	462.93	35.35	530.06	18.97	572.07	13.84	624.74	24.84					496.09	37.68	567.60	25.46	607.73	30.66	645.43	29.88				
OCE/TI	2.	462.76	39.17	532.67	19.81	577.79	16.47	641.15	32.19					494.93	47.67	565.01	26.95	607.47	23.55	646.67	26.83				
OCE/OCE	3.	469.16	32.91	537.65	21.34	585.54	30.08	652.20	37.29					491.40	39.95	565.13	41.70	606.38	26.73	671.80	43.54				
NCE/TI	4.	471.15	35.86	535.46	18.30	577.79	19.30	642.35	36.07					496.39	40.23	566.22	25.89	613.82	25.37	672.74	41.71				
NCE/NCE	5.	477.49	31.32	538.00	18.91	577.10	18.57	643.79	36.65					499.06	39.96	569.71	28.63	615.93	26.52	685.11	44.15				
NCE/NCE	6.	473.99	33.82	535.39	19.99	578.94	19.73	644.48	37.94					496.75	41.81	565.55	28.21	613.63	26.60	671.95	42.69				
		Fall, 1977												**Fall, 1977**											
Title I/TI	1.	469.17	39.83	534.42	26.63	514.85	21.58	622.96	[illegible]7.27					502.69	45.55	560.91	41.19	609.14	49.51	664.64	44.50				
OCE/TI	2.	468.21	41.62	537.23	26.83	579.62	27.76	649.60	[illegible]9.85					502.51	51.60	572.96	42.44	623.67	26.63	657.13	41.09				
OCE/OCE	3.	473.32	42.46	534.85	39.23	573.83	29.43	647.60	40.36					498.83	49.34	547.23	38.65	610.71	36.88	659.00	54.64				
NCE/TI	4.	482.00	39.58	543.69	23.13	588.79	28.71	653.48	39.57					509.66	45.88	568.24	36.02	612.28	34.50	665.81	44.43				
NCE/OCE	5.	483.09	38.46	544.11	25.10	588.04	28.71	656.44	39.41					507.83	45.13	570.43	40.05	613.12	37.32	677.34	48.72				
NCE/NCE	6.	484.77	38.76	545.42	25.99	587.84	26.49	657.74	44.32					512.38	51.22	566.31	40.78	615.28	35.90	677.09	47.33				

Table D-2

Mean Reading Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 1-2

Selection Category Students/School	CTBS Fall, 1976				CTBS Spring, 1977				CTBS Fall, 1977			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Title I/Title I												
Attend	302.36	336.84	358.58	378.82	353.95	389.49	424.62	46[illegible].36	361.85	393.68	434.20	460.45
Non-Attend	303.74	332.24	353.04	379.91	358.96	398.41	430.43	461.40	364.16	398.97	435.05	460.02
Other-CE/Title I												
Attend	310.35	334.07	357.24	380.67	357.54	393.39	435.41	466.17	364.92	405.25	441.53	463.83
Non-Attend	311.15	335.44	358.52	387.45	354.78	394.73	424.47	458.45	365.33	403.25	438.69	460.24
Other-CE/Other-CE												
Attend	316.50	332.79	364.10	—	364.08	395.79	422.80	—	374.58	409.86	430.00	—
Non-Attend	302.16	334.96	366.14	392.10	359.16	392.24	416.00	485.20	369.41	396.24	423.20	486.20
Non-CE-Title I												
Attend	303.78	333.93	356.00	386.70	360.09	396.61	433.15	464.46	370.43	407.58	441.20	476.22
Non-Attend	307.36	334.75	357.01	385.99	361.57	399.15	428.26	468.12	376.62	408.15	440.82	476.40
Non-CE/Other-CE												
Attend	306.29	336.89	357.43	382.22	364.88	395.90	427.93	461.87	376.18	407.15	440.60	474.13
Non-Attend	307.62	335.50	360.86	388.23	368.29	397.89	425.35	466.75	384.19	405.93	440.40	478.03
Non-CE/Non-CE												
Attend	312.75	334.27	359.69	385.06	359.50	397.31	421.40	460.75	362.17	407.35	442.09	477.86
Non-Attend	302.39	330.67	359.24	387.81	363.35	402.77	425.01	459.91	372.36	409.31	432.66	473.86

Table D-3

Mean Reading Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 2-3

Selection Category Students/School	CTBS Fall, 1976				CTBS Spring, 1977				CTBS Fall, 1977			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Title I/Title I												
Attend	355.12	398.44	430.63	461.67	397.83	443.81	478.26	522.33	400.30	446.18	476.14	478.
Non-Attend	357.09	398.09	424.95	460.47	396.35	446.47	488.50	517.38	402.37	448.41	481.17	516.
Other-CE/Title I												
Attend	359.40	407.03	432.75	476.11	393.21	441.69	475.50	519.22	409.43	450.97	476.67	521.
Non-Attend	363.15	403.52	432.97	466.28	402.14	444.82	481.04	525.18	408.33	453.76	488.59	525.
Other-CE-Other-CE												
Attend	362.37	393.97	420.00	450.00	389.91	448.59	490.00	504.00	412.77	456.25	489.09	493.
Non-Attend	358.51	399.40	416.86	475.13	402.00	442.10	490.79	522.75	410.07	448.02	491.29	525.
Non-CE/Title I												
Attend	359.59	405.57	438.47	468.83	393.91	443.93	475.94	516.92	396.58	450.30	486.98	515.
Non-Attend	360.68	404.94	436.28	476.51	400.76	446.62	481.67	526.81	408.80	454.53	491.65	529.
Non-CE/Other CE												
Attend	364.39	406.65	437.15	481.22	404.56	445.61	483.15	520.31	426.00	459.18	492.47	531.
Non-Attend	364.60	404.34	436.59	484.63	412.41	447.47	482.37	528.36	422.78	455.85	494.30	537.
Non-CE/Non-CE												
Attend	369.06	403.75	437.17	482.40	400.38	440.25	480.46	518.47	414.35	446.93	487.98	521.
Non-Attend	362.20	405.56	434.69	480.09	397.12	443.11	484.58	523.90	408.34	449.08	491.21	533.

Table D-4

Mean Reading Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 3-4

Selection Category Students/School	CTBS Fall, 1976 Q1	Q2	Q3	Q4	CTBS Spring, 1977 Q1	Q2	Q3	Q4	CTBS Fall, 1977 Q1	Q2	Q3	Q4
Title I/Title I												
Attend	390.05	437.29	475.95	517.00	423.35	478.95	515.33	548.00	421.87	477.63	506.48	488.00
Non-Attend	392.25	440.22	477.11	513.25	427.51	481.19	518.30	548.21	429.45	479.65	515.88	571.92
Other-CE/Title I												
Attend	395.35	443.45	485.07	516.67	427.22	479.05	516.07	543.78	433.32	478.11	533.60	572.67
Non-Attend	396.86	445.16	481.00	530.10	430.32	477.23	516.02	556.58	424.65	476.52	521.51	578.51
Other-CE/Other-CE												
Attend	389.93	432.79	480.90	548.00	421.28	468.68	514.20	548.00	428.07	460.26	507.70	631.00
Non-Attend	396.07	438.09	475.44	540.67	425.95	482.49	519.78	571.67	427.96	481.29	519.44	599.33
Non-CE/Title I												
Attend	401.36	446.94	486.10	527.44	426.66	478.73	511.81	545.54	431.62	481.86	524.99	566.80
Non-Attend	404.11	447.93	485.70	527.61	434.30	481.26	516.79	561.24	439.55	490.51	529.21	580.26
Non-CE/Other-CE												
Attend	410.00	444.91	487.82	537.50	436.97	482.24	510.82	572.10	448.13	490.24	528.13	586.52
Non-Attend	406.71	445.32	485.32	535.08	437.46	482.36	518.89	573.39	442.93	490.55	529.72	587.85
Non-CE/Non-CE												
Attend	397.86	440.56	488.85	531.12	431.86	476.44	517.03	583.85	439.23	479.05	533.23	595.46
Non-Attend	399.27	445.57	486.22	530.71	432.65	479.74	516.59	564.30	436.72	487.66	527.92	585.46

Table D-5

Mean Reading Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 4-5

Selection Category Students/School	CTBS Fall, 1976				CTBS Spring, 1977				CTBS Fall, 1977			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Title I/Title I												
Attend	414.89	463.00	508.33	557.50	441.53	508.12	550.50	593.50	442.61	498.61	546.67	596.50
Non-Attend	415.19	473.77	507.04	558.85	446.19	504.76	547.95	598.90	448.33	506.31	544.63	612.70
Other-CE/Title I												
Attend	411.73	477.57	514.50	—	431.08	500.93	541.83	—	446.47	507.21	540.83	—
Non-Attend	419.97	476.06	509.86	566.23	445.99	508.10	548.31	608.61	456.43	512.88	547.43	608.48
Other-CE/Other-CE												
Attend	408.31	446.43	509.43	580.67	439.77	507.86	550.29	609.67	445.91	483.86	557.14	602.67
Non-Attend	415.91	472.70	507.42	572.75	454.01	507.05	545.53	640.25	451.90	514.16	531.58	651.25
Non-CE/Title I												
Attend	415.21	477.28	512.78	572.09	452.03	502.96	548.22	611.59	453.04	514.19	556.97	615.38
Non-Attend	424.79	480.04	516.28	572.81	455.32	580.03	547.41	605.87	461.78	514.50	556.75	616.63
Non-CE/Other-CE												
Attend	422.09	478.59	517.04	591.94	450.93	508.10	550.92	609.10	465.84	517.18	556.24	629.80
Non-Attend	427.73	479.86	516.12	578.74	456.54	509.66	551.06	610.77	462.56	515.47	550.66	618.81
Non-CE/Non-CE												
Attend	423.05	480.18	520.73	575.65	452.13	509.05	548.37	601.57	459.70	526.50	562.97	618.41
Non-Attend	420.07	480.79	515.87	576.59	450.78	505.67	549.91	604.39	459.90	515.47	558.18	616.27

Table D-6

Mean Reading Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 5-6

Selection Category Students/School	CTBS Fall, 1976 Q1	Q2	Q3	Q4	CTBS Spring, 1977 Q1	Q2	Q3	Q4	CTBS Fall, 1977 Q1	Q2	Q3	Q4
Title I/Title I												
Attend	436.85	502.53	543.17	579.33	457.93	523.11	567.17	621.00	463.31	535.06	570.83	611.67
Non-Attend	442.11	501.96	541.64	595.15	464.56	531.20	577.60	525.30	471.15	534.31	575.29	624.65
Other-CE/Title I												
Attend	433.52	513.17	563.50	598.50	454.14	523.42	576.50	613.00	457.45	534.25	568.67	644.00
Non-Attend	447.53	507.01	545.55	602.89	466.92	534.48	578.32	642.28	472.20	537.27	584.32	650.22
Other-CE/Other-CE												
Attend	438.07	500.21	530.43	604.50	465.20	535.93	600.14	658.00	479.33	520.71	588.43	660.25
Non-Attend	448.31	502.37	540.47	610.67	470.32	535.13	579.53	648.33	474.27	539.15	567.82	639.17
Non-CE/Title I												
Attend	449.26	502.52	547.70	599.32	464.00	531.00	579.46	630.05	481.04	539.73	585.00	646.36
Non-Attend	453.45	510.68	550.12	607.88	472.47	535.85	577.71	642.85	482.05	544.03	589.07	653.77
Non-CE/Other-CE												
Attend	452.61	509.60	551.49	614.84	475.28	535.74	575.43	639.42	486.49	541.32	595.35	656.07
Non-Attend	451.28	512.38	549.83	507.36	478.22	538.40	577.45	644.41	481.97	544.66	586.72	656.61
Non-CE/Non-CE												
Attend	441.03	507.89	558.30	616.45	459.33	535.77	576.70	644.81	474.08	544.37	591.50	668.55
Non-Attend	450.57	507.13	551.41	611.24	476.07	534.50	577.93	644.35	486.22	543.31	586.37	655.11

Table D-7

Mean Math Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 1-2

Selection Category Students/School	CTBS Fall, 1976 Q1	Q2	Q3	Q4	CTBS Spring, 1977 Q1	Q2	Q3	Q4	CTBS Fall, 1977 Q1	Q2	Q3	Q4
Title I/Title I												
Attend	282.[illegible]	311.12	344.55	358.77	337.49	386.36	410.70	449.85	342.54	384.96	415.20	435.31
Non-Attend	286.53	315.46	342.49	367.90	341.44	379.79	415.10	458.12	351.68	372.62	402.98	427.13
Other-CE/Title I												
Attend	288.88	313.65	340.53	357.57	343.19	382.57	413.06	445.57	369.09	396.22	405.88	454.29
Non-Attend	290.56	318.93	347.14	371.33	343.95	376.02	409.03	444.29	364.06	384.90	413.48	445.67
Other-CE/Other-CE												
Attend	289.25	320.40	342.13	366.00	354.00	382.60	421.88	465.00	345.25	369.80	406.50	477.00
Non-Attend	293.39	320.16	342.63	375.10	340.57	374.05	410.75	477.00	354.36	374.47	379.88	457.10
Non-CE-Title I												
Attend	293.78	320.17	339.86	371.69	337.29	379.19	411.02	450.86	354.99	382.92	412.87	445.85
Non-Attend	292.75	319.74	343.17	374.64	342.00	381.09	413.17	451.87	358.75	386.88	415.19	449.36
Non-CE/Other-CE												
Attend	291.68	323.19	346.92	383.08	345.65	377.34	406.29	446.44	359.19	380.97	416.92	450.58
Non-Attend	292.81	322.15	345.56	377.51	346.39	379.77	410.14	449.18	361.40	386.99	414.77	445.41
Non-CE/Non-CE												
Attend	295.33	326.48	352.93	380.03	346.83	373.48	404.33	449.47	365.33	375.44	418.26	454.39
Non-Attend	288.99	318.79	347.89	376.71	342.95	382.45	409.36	443.25	355.50	391.06	411.51	445.53

Table D-8

Mean Math Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 2-3

Selection Category Students/School	CTBS Fall, 1976				CTBS Spring, 1977				CTBS Fall, 1977			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Title I/Title I												
Attend	332.36	382.99	414.00	448.00	379.16	431.59	472.63	502.30	395.78	435.49	479.05	492.90
Non-Attend	337.26	374.82	410.47	443.67	383.91	435.21	470.50	511.61	393.35	428.88	460.86	511.56
Other-CE/Title I												
Attend	337.62	382.09	416.13	455.31	391.62	436.35	461.27	505.88	394.64	441.00	482.73	510.50
Non-Attend	339.55	376.57	415.86	448.07	393.79	433.43	469.27	510.00	400.72	432.87	474.68	505.10
Other-CE/Other-CE												
Attend	342.59	371.30	423.00	449.50	383.53	428.30	457.75	531.00	401.12	425.50	466.75	539.00
Non-Attend	348.26	381.91	404.29	459.33	383.36	435.32	471.71	501.00	396.74	434.18	467.71	511.67
Non-CE/Title I												
Attend	340.76	380.92	410.40	449.17	387.72	434.03	469.52	508.90	392.47	431.88	468.60	511.08
Non-Attend	341.25	380.71	410.75	449.60	389.36	437.08	471.12	510.18	396.00	436.43	466.67	503.08
Non-CE/Other-CE												
Attend	344.71	383.27	413.04	452.52	382.38	434.94	465.94	511.91	407.35	445.16	469.05	510.45
Non-Attend	347.61	381.02	412.05	454.06	391.47	436.45	471.53	513.00	402.75	437.85	471.14	507.71
Non-CE/Non-CE												
Attend	338.74	378.92	411.52	455.88	386.91	438.86	464.90	515.00	408.74	435.11	452.44	498.44
Non-Attend	347.07	381.55	412.91	443.85	388.69	434.86	470.53	506.75	400.74	436.97	465.57	497.02

Table D-9

Mean Math Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 3-4

Selection Category Students/School	CTBS Fall, 1976				CTBS Spring, 1977				CTBS Fall, 1977			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Title I/Title I												
Attend	375.58	424.28	455.67	496.36	423.85	481.51	516.09	534.82	423.95	474.68	503.07	538.91
Non-Attend	380.23	421.11	452.62	495.16	436.13	485.33	519.50	543.29	432.60	479.69	515.14	541.52
Other-CE/Title I												
Attend	378.70	428.00	456.87	504.67	425.07	487.34	520.48	533.20	434.93	486.43	508.09	573.27
Non-Attend	373.78	426.09	459.61	511.38	431.94	481.02	514.67	542.56	436.81	484.95	518.97	553.63
Other-CE/Other-CE												
Attend	397.17	432.27	468.00	503.25	441.83	478.64	523.20	539.00	442.25	457.83	528.00	561.25
Non-Attend	380.47	430.82	464.00	484.00	413.89	488.07	529.60	544.00	417.27	481.57	515.73	501.00
Non-CE/Title I												
Attend	382.05	431.58	462.66	499.06	428.80	480.61	513.95	551.19	431.62	473.13	511.70	558.63
Non-Attend	388.95	432.33	462.86	505.68	438.47	484.07	522.51	563.33	441.36	485.18	523.08	569.01
Non-CE/Other-CE												
Attend	384.67	431.05	462.76	504.84	435.00	485.30	523.43	574.08	431.23	487.75	520.57	578.29
Non-Attend	386.06	429.80	462.26	505.87	441.65	488.67	525.44	574.75	445.16	487.96	528.28	574.36
Non-CE/Non-CE												
Attend	382.92	428.89	459.36	512.67	427.12	483.27	529.88	582.37	434.61	470.64	528.00	580.81
Non-attend	387.66	428.91	462.11	499.38	436.73	485.68	526.68	571.89	440.35	484.52	522.87	569.97

Table D-10

Mean Math Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 4-5

Selection Category Students/School	CTBS Fall, 1976				CTBS Spring, 1977				CTBS Fall, 1977			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Title I/Title I												
Attend	414.58	470.29	505.93	555.80	461.80	529.06	572.53	613.20	464.70	521.54	577.80	594.40
Non-Attend	416.79	473.37	511.52	554.31	466.49	531.11	574.25	606.44	467.42	520.52	557.88	599.56
Other-CE/Title I												
Attend	416.72	473.50	521.19	592.50	460.30	528.43	565.56	621.50	468.84	523.93	568.19	641.00
Non-Attend	416.15	477.67	515.29	564.30	450.04	532.04	574.79	507.85	460.71	528.92	576.07	617.25
Other-CE/Other-CE												
Attend	410.65	475.85	510.14	556.50	447.75	528.92	560.29	603.50	466.70	508.15	547.29	602.00
Non-Attend	426.06	484.00	526.63	581.33	466.94	531.93	563.38	628.33	464.62	539.36	545.50	581.33
Non-CE/Title I												
Attend	421.22	476.25	514.22	567.03	468.09	530.67	572.33	611.43	468.18	527.53	567.87	602.57
Non-Attend	426.16	480.62	518.93	573.95	473.19	528.69	573.79	523.80	475.17	524.59	567.07	615.45
Non-CE/Other-CE												
Attend	429.00	478.18	510.30	579.16	465.33	529.91	583.02	640.88	478.35	527.27	563.65	633.95
Non-Attend	429.21	479.15	513.50	573.87	476.78	530.68	581.36	631.54	478.12	526.15	569.56	623.04
Non-CE/Non-CE												
Attend	427.38	480.00	510.41	579.00	452.97	521.28	577.06	625.84	470.41	531.28	571.65	639.21
Non-Attend	427.52	478.11	513.54	568.22	465.93	528.65	575.57	529.02	479.36	526.03	566.15	614.16

Table D-11

Mean Math Scores by Summer School Attendance and Non-Attendance, by CE Selection Category and Quarters of Achievement Distribution—Cohort 5-6

Selection Category Students/School	CTBS Fall, 1976				CTBS Spring, 1977				CTBS Fall, 1977			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Title I/Title I												
Attend	454.31	520.35	556.22	—	487.71	559.28	594.22	—	496.64	558.77	600.44	—
Non-Attend	459.88	513.86	562.10	610.86	499.31	569.82	609.51	645.43	504.84	561.38	610.29	664.64
Other-CE/Title I												
Attend	443.09	520.67	562.88	610.60	473.26	574.11	615.50	635.60	496.26	575.44	634.75	664.40
Non-Attend	457.12	524.51	569.94	611.42	501.53	564.17	606.31	649.25	503.76	572.41	622.33	655.38
Other-CE/Other-CE												
Attend	449.11	515.50	567.25	615.00	491.22	577.50	610.75	685.33	499.56	572.63	620.88	672.33
Non-Attend	449.21	513.32	574.19	622.50	491.44	560.64	604.19	651.50	498.67	538.68	605.63	639.00
Non-CE/Title I												
Attend	460.21	521.36	566.71	607.31	488.18	564.32	613.80	662.34	504.79	568.69	612.16	656.41
Non-Attend	465.39	524.80	568.78	620.76	497.69	566.45	614.06	673.19	510.23	568.17	612.36	666.22
Non-CE/Other-CE												
Attend	465.41	519.04	567.32	620.88	500.16	565.69	614.47	680.22	502.69	571.74	603.68	669.48
Non-Attend	467.02	522.17	569.53	626.22	498.70	570.53	616.11	686.02	508.98	570.34	614.55	678.67
Non-CE/Non-CE												
Attend	446.26	525.58	565.50	623.75	480.56	565.36	627.19	692.94	499.67	567.42	620.35	692.08
Non-Attend	465.30	522.79	570.77	620.69	500.25	564.28	611.18	667.83	511.97	564.08	613.28	673.93

Table D-12

Mean Summer Gains (Losses) for Title I Students, by Quarters of Achievement Gain in the Preceding School Year and by Attendance and Non-Attendance at Summer School

	Quarter of Preceding Year's Gains							
	Lowest		Second		Third		Fourth	
	N	Summer Gains	N	Summer Gains	N	Summer Gains	N	Summer Gains
				Reading				
Cohort 1-2								
Attend	95	28.65	75	3.31	90	−3.16	64	−8.58
Non-Attend	223	18.39	245	2.42	255	2.65	290	−7.40
Cohort 2-3								
Attend	87	13.01	92	3.02	106	2.58	86	−14.17
Non-Attend	296	16.31	268	7.87	274	1.18	293	−12.17
Cohort 3-4								
Attend	129	12.45	136	0.34	108	−4.73	125	−17.04
Non-Attend	287	20.00	264	3.31	286	−3.55	295	−15.56
Cohort 4-5								
Attend	84	23.26	74	2.37	82	−10.34	75	−22.61
Non-Attend	229	21.13	262	6.96	232	−3.09	249	−16.93
Cohort 5-6								
Attend	64	23.63	57	15.21	47	1.49	57	−18.53
Non-Attend	189	22.47	214	9.33	222	0.61	206	−9.82
				Math				
Cohort 1-2								
Attend	48	26.17	46	2.13	53	−7.79	54	−12.52
Non-Attend	135	22.76	130	5.47	132	−9.39	147	−28.03
Cohort 2-3								
Attend	72	33.82	53	14.42	47	−2.94	57	−10.72
Non-Attend	127	27.94	147	8.72	144	−3.90	142	−21.91
Cohort 3-4								
Attend	108	20.19	78	−0.69	88	−10.51	71	−31.76
Non-Attend	140	15.71	125	0.82	164	−8.13	185	−20.94
Cohort 4-5								
Attend	63	24.03	63	3.56	59	−11.08	56	−19.91
Non-Attend	147	20.50	148	−0.49	148	−9.72	150	−28.86
Cohort 5-6								
Attend	55	24.69	43	8.67	36	8.81	39	−23.95
Non-Attend	129	24.22	149	7.32	147	−2.44	153	−21.68

Table D-13

Mean Summer Gain (Losses) by Quarters of Achievement Gains in the Preceding School Year and by Attendance and Non-Attendance at Summer School by CE Selection Categories—Reading

Selection Category	Quarter of Preceding Year's Gains							
		Lowest		Second		Third		Fourth
	N	Summer Gain	N	Summer Gain	N	Summer Gain	N	Summer Gain
Other CE/Title I School								
Cohort 1-2								
Attend	17	25.12	14	14.64	19	3.11	27	−2.85
Non-Attend	81	20.30	88	11.48	81	5.53	79	1.86
Cohort 2-3								
Attend	33	24.52	24	13.25	21	−3.67	22	1.91
Non-Attend	74	19.19	79	11.04	85	3.78	87	−5.38
Cohort 3-4								
Attend	30	23.20	33	11.21	36	6.03	35	−10.20
Non-Attend	81	27.65	87	5.43	81	−2.01	82	−25.79
Cohort 4-5								
Attend	27	28.81	16	18.56	21	−1.19	15	−4.00
Non-Attend	71	33.18	83	11.10	77	−2.90	88	−10.36
Cohort 5-6								
Attend	15	19.40	13	5.77	9	1.78	12	−14.75
Non-Attend	45	20.13	44	8.34	50	−1.52	47	−6.98
Other CE/Other CE								
Cohort 1-2								
Attend	10	30.60	5	−2.40	9	1.89	12	7.00
Non-Attend	19	30.42	32	2.19	36	0.75	27	1.81
Cohort 2-3								
Attend	18	39.39	23	10.70	21	3.57	17	−0.35
Non-Attend	46	23.00	32	11.22	51	−0.84	43	−5.70
Cohort 3-4								
Attend	14	26.71	13	−5.92	19	0.16	13	−18.85
Non-Attend	36	12.11	40	2.10	36	6.03	40	−13.00
Cohort 4-5								
Attend	17	28.24	14	0.64	15	7.00	20	−32.00
Non-Attend	36	16.75	39	−1.08	37	−5.86	33	−12.64
Cohort 5-6								
Attend	8	9.63	7	7.14	10	8.40	15	−28.33
Non-Attend	34	15.76	33	3.88	34	−3.71	27	−13.85
Non-CE/Title I School								
Cohort 1-2								
Attend	90	20.27	82	12.44	86	8.57	74	−2.76
Non-Attend	711	22.24	768	11.34	748	10.25	783	0.89
Cohort 2-3								
Attend	93	19.66	70	4.94	74	0.64	56	−12.48
Non-Attend	627	18.48	621	10.13	702	5.46	672	−4.22
Cohort 3-4								
Attend	96	23.79	92	10.48	76	4.26	68	−13.43
Non-Attend	631	30.14	630	15.94	654	8.68	693	−3.28
Cohort 4-5								
Attend	77	24.88	72	8.64	62	4.42	90	−11.63
Non-Attend	721	22.53	708	12.35	729	6.30	683	−8.51
Cohort 5-6								
Attend	65	28.69	41	15.22	49	8.24	51	−7.31
Non-Attend	668	22.45	685	13.20	695	6.80	672	−2.28

Table D-13 (Continued)

Non-CE/Other CE								
Cohort 1-2								
Attend	39	19.87	44	8.43	45	18.02	38	0.45
Non-Attend	306	21.16	323	13.83	348	12.53	340	2.37
Cohort 2-3								
Attend	42	28.00	42	18.62	41	4.41	38	–3.53
Non-Attend	310	22.62	294	12.10	311	8.31	323	–2.76
Cohort 3-4								
Attend	56	30.91	50	13.50	51	10.51	43	–8.26
Non-Attend	328	28.25	309	14.87	335	6.74	337	–5.32
Cohort 4-5								
Attend	55	30.84	40	10.05	47	9.68	42	5.41
Non-Attend	331	20.61	346	10.36	343	3.76	338	–7.14
Cohort 5-6								
Attend	86	28.78	50	15.30	58	12.26	65	–8.15
Non-Attend	315	23.90	259	9.79	342	9.28	346	–7.05
Non-CE/Non-CE								
Cohort 1-2								
Attend	32	18.59	32	17.13	28	14.93	27	10.33
Non-Attend	164	18.69	173	7.29	190	11.37	205	–0.10
Cohort 2-3								
Attend	53	21.79	36	10.47	43	–2.30	34	–4.56
Non-Attend	151	21.26	182	9.30	164	3.15	173	–0.70
Cohort 3-4								
Attend	38	29.03	44	9.64	31	5.68	52	–4.38
Non-Attend	184	26.03	199	15.17	193	5.66	187	–5.55
Cohort 4-5								
Attend	36	30.72	36	15.89	39	11.44	36	–1.72
Non-Attend	178	27.89	215	10.75	196	6.12	185	–5.62
Cohort 5-6								
Attend	44	29.84	31	12.55	35	2.91	25	10.08
Non-Attend	226	24.37	240	11.77	236	8.39	237	–6.13
Needy NCE/NCE								
Cohort 1-2								
Attend	3	2.33	5	–5.00	1	20.00	3	–3.00
Non-Attend	29	27.79	34	7.53	41	–0.39	56	–5.63
Cohort 2-3								
Attend	19	27.00	12	22.42	12	1.08	15	–11.27
Non-Attend	45	25.71	56	6.82	46	1.46	50	–1.86
Cohort 3-4								
Attend	17	20.88	17	5.06	15	–5.80	18	7.22
Non-Attend	59	20.90	69	6.52	17	–1.44	63	–8.02
Cohort 4-5								
Attend	17	32.41	12	–1.50	13	3.85	11	–14.00
Non-Attend	64	29.41	68	11.43	71	4.11	72	–9.75
Cohort 5-6								
Attend	12	34.00	11	8.55	10	1.70	8	–4.38
Non-Attend	72	25.74	78	11.92	75	6.85	76	–7.20

Table D-14

Mean Summer Gains (Losses) by Quarters of Achievement Gains in Preceding School Year and by Attendance and Non-Attendance at Summer School for CE Selection Categories—Math

	Quarter of Preceding Year's Gains							
Selection Category	Lowest		Second		Third		Fourth	
	N	Summer Gain	N	Summer Gain	N	Summer Gain	N	Summer Gain
Other CE/Title I School								
Cohort 1-2								
Attend	20	32.15	12	18.83	19	9.58	28	1.11
Non-Attend	50	28.44	58	18.05	48	−2.85	50	−3.98
Cohort 2-3								
Attend	22	25.23	27	13.52	26	−2.35	18	−13.22
Non-Attend	51	24.04	38	10.61	54	−5.22	52	−16.62
Cohort 3-4								
Attend	29	25.52	29	10.66	34	−0.84	24	−13.04
Non-Attend	60	32.40	53	11.68	58	−1.90	64	−18.91
Cohort 4-5								
Attend	19	37.26	18	1.28	21	−3.24	17	−16.35
Non-Attend	65	28.72	68	9.57	60	−1.23	66	−20.00
Cohort 5-6								
Attend	11	54.45	11	31.27	10	3.50	13	−10.69
Non-Attend	50	26.32	50	18.62	50	3.46	49	17.67
Other CE/Other CE								
Cohort 1-2								
Attend	4	−1.00	2	−5.50	3	−8.67	9	−18.78
Non-Attend	17	20.59	17	0.00	15	0.47	16	−25.56
Cohort 2-3								
Attend	7	24.43	12	15.50	4	8.50	10	−6.80
Non-Attend	17	32.00	18	11.28	21	6.19	18	−18.67
Cohort 3-4								
Attend	8	15.25	9	−0.44	7	8.86	8	−36.38
Non-Attend	22	23.59	22	6.59	22	−18.09	23	−23.74
Cohort 4-5								
Attend	12	20.67	12	5.58	8	−9.75	12	−18.75
Non-Attend	14	24.71	13	−11.00	17	1.47	15	−32.47
Cohort 5-6								
Attend	6	27.50	8	16.38	6	13.50	8	−37.38
Non-Attend	21	23.48	18	10.50	21	−7.67	19	−38.11
Non-CE/Title I School								
Cohort 1-2								
Attend	135	22.73	114	8.48	98	3.00	107	−14.36
Non-Attend	799	23.04	930	9.93	958	1.32	919	−12.34
Cohort 2-3								
Attend	136	23.73	96	2.98	93	−6.47	112	−21.85
Non-Attend	787	17.14	821	3.75	908	−5.59	823	−21.10
Cohort 3-4								
Attend	146	20.37	141	0.76	116	−9.78	101	−24.99
Non-Attend	751	25.96	804	9.19	797	−3.12	802	−21.43
Cohort 4-5								
Attend	94	20.44	89	2.39	92	−5.90	97	−25.57
Non-Attend	812	15.79	868	1.14	812	−7.44	833	−27.36
Cohort 5-6								
Attend	65	29.77	82	11.84	53	−1.11	59	−19.63
Non-Attend	764	23.72	745	5.93	761	−4.54	760	−21.78

Table D-14 (Continued)

Non-CE/Other CE School								
Cohort 1-2								
Attend	56	23.00	47	10.38	46	0.17	40	–8.73
Non-Attend	312	20.28	335	9.42	369	1.52	350	–12.14
Cohort 2-3								
Attend	50	25.34	65	12.86	51	0.59	43	–10.12
Non-Attend	334	18.36	322	7.38	339	–4.74	338	–19.05
Cohort 3-4								
Attend	58	22.02	65	0.46	55	–11.89	50	–13.42
Non-Attend	322	24.88	332	6.01	345	–4.03	341	–20.98
Cohort 4-5								
Attend	56	14.64	53	4.87	50	–14.70	46	–24.83
Non-Attend	349	10.43	367	–0.63	352	–11.41	373	–25.25
Cohort 5-6								
Attend	77	19.62	60	–3.30	65	–10.06	69	–21.28
Non-Attend	348	20.77	371	3.51	357	–4.01	357	–23.04
Non-CE/Non-CE								
Cohort 1-2								
Attend	29	34.48	33	–3.55	33	7.42	24	–3.38
Non-Attend	158	20.78	177	12.63	186	4.67	210	–8.00
Cohort 2-3								
Attend	42	17.88	35	0.09	47	–4.72	39	–31.21
Non-Attend	153	23.65	185	3.52	158	–4.28	170	20.45
Cohort 3-4								
Attend	41	13.27	40	3.10	48	–6.50	35	–18.60
Non-Attend	184	22.04	193	4.59	187	–4.65	198	–23.95
Cohort 4-5								
Attend	46	32.43	29	11.38	33	–6.36	29	–15.48
Non-Attend	178	22.60	183	1.37	198	–8.11	189	–27.50
Cohort 5-6								
Attend	25	42.60	32	5.31	35	6.03	46	–16.63
Non-Attend	244	25.41	252	12.97	237	1.33	229	–23.45
Needy Non-CE/Non-CE								
Cohort 1-2								
Attend	4	46.25	3	–5.33	2	–21.00	3	15.67
Non-Attend	28	26.68	41	14.76	40	1.33	47	–16.68
Cohort 2-3								
Attend	9	57.33	16	–6.75	16	7.50	15	–30.87
Non-Attend	48	34.75	51	2.65	48	–6.19	50	–24.26
Cohort 3-4								
Attend	21	9.81	14	–6.93	18	–10.56	13	–25.85
Non-Attend	58	6.53	65	2.95	64	–7.63	71	–19.66
Cohort 4-5								
Attend	20	22.80	12	17.25	11	–1.55	6	–24.50
Non-Attend	54	19.09	66	–3.00	68	–6.25	70	–26.11
Cohort 5-6								
Attend	11	28.73	13	4.08	8	21.75	11	–25.09
Non-Attend	77	24.45	68	12.68	85	8.31	76	21.43

Table D-15

Reading and Math Test Scores for Five Cohorts Over Three Test Administrations, Semi-Longitudinal Sample

Cohort	Fall, 1976		Spring, 1977		Fall, 1977	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Reading						
1-2	342	33	407	45	416	49
2-3	412	49	456	52	463	55
3-4	457	54	490	54	499	63
4-5	488	62	519	63	526	67
5-6	520	64	547	69	556	73
Math						
1-2	329	35	391	45	396	46
2-3	391	45	445	51	446	50
3-4	441	49	498	54	498	58
4-5	491	59	543	64	539	64
5-6	538	64	582	72	584	71

Table D-16

Mean Reading and Math Test Scores (VSS and Percentile), by Summer School Attendance, for Five Cohorts of Title I Students, Semi-Longitudinal Sample

Summer School Attendance	Fall, 1976		Spring, 1977		Fall, 1977		Summer Gain	
	VSS	Percentile	VSS	Percentile	VSS	Percentile	VSS	Percentile
Reading								
Cohort 1-2								
Attend	324	30	379	27	386	28	7	1
Non-Attend	325	31	389	33	393	33	4	0
Cohort 2-3								
Attend	376	23	420	24	421	26	1	2
Non-Attend	380	25	424	27	427	30	3	3
Cohort 3-4								
Attend	405	17	440	19	438	21	–2	2
Non-Attend	418	24	455	27	457	29	2	2
Cohort 4-5								
Attended	430	17	460	19	459	19	–1	0
Non-Attend	441	22	473	24	475	25	2	1
Cohort 5-6								
Attend	452	16	473	16	480	17	7	1
Non-Attend	468	22	493	22	498	24	5	2
Math								
Cohort 1-2								
Attend	304	28	370	34	372	34	2	0
Non-Attend	313	34	377	37	374	35	–3	–2
Cohort 2-3								
Attend	360	27	410	26	419	33	9	7
Non-Attend	361	26	415	28	417	32	1	4
Cohort 3-4								
Attend	401	23	453	26	449	26	–4	0
Non-Attend	411	28	472	34	468	35	–4	1
Cohort 4-5								
Attend	437	20	488	22	488	24	0	2
Non-Attend	449	25	502	27	497	28	–5	1
Cohort 5-6								
Attend	476	18	512	19	518	23	6	4
Non-Attend	493	25	538	28	539	30	1	2

Table D-17

Proportions of Reading and Math Posttest Variance Accounted for by Pretest and Summer School Attendance, by CE Selection Category for Five Cohorts *

	Proportion of Posttest Variance Accounted for by Pretest	Proportion of Posttest Variance Accounted for by Attendance	R^2
		Reading	
Cohort 1-2			
Title I	.4567	.0053	.4616
Other CE	.6527	.0004	.6529
Non-CE	.6412	.0005	.6413
Cohort 2-3			
Title I	.5201	.0000	.5201
Other CE	.6949	.0019	.6919
Non-CE	.7022	.0002	.7088
Cohort 3-4			
Title I	.4564	.0016	.4629
Other CE	.6091	.0009	.6130
Non-CE	.7044	.0000	.7058
Cohort 4-5			
Title I	.4591	.0042	.4915
Other CE	.6809	.0000	.6924
Non-CE	.7930	.0031	.7934
Cohort 5-6			
Title I	.6091	.0007	.6285
Other CE	.7492	.0016	.7655
Non-CE	.8207	.0006	.8206
		Math	
Cohort 1-2			
Title I	.4319	.0011	.4323
Other CE	.4322	.0055	.4729
Non-CE	.5306	.0000	.5326
Cohort 2-3			
Title I	.3623	.0043	.3744
Other CE	.5217	.0033	.5625
Non-CE	.5856	.0002	.5882
Cohort 3-4			
Title I	.4737	.0008	.4796
Other CE	.5376	.0722	.6928
Non-CE	.6061	.0003	.6135
Cohort 4-5			
Title I	.5384	.0003	.5397
Other CE	.5786	.0016	.6069
Non-CE	.6693	.0001	.6714
Cohort 5-6			
Title I	.4266	.0008	.4497
Other CE	.5570	.0202	.7087
Non-CE	.6875	.0000	.6877

* Semi-longitudinal, including students missing certain socioeconomic variables.

Table D-18

Regression Analysis Results for Summer School Attendance, by CE Selection Category for Five Cohorts, by Reading and Math***

	Reading					Math			
Selection Category	Pretest	Attendance	Constant	R²	Selection Category	Pretest	Attendance	Constant	R²
Cohort 1-2					Cohort 1-2				
Title	.73**	5.57*	106	.46	Title I	.63**	−2.70	139	.43
	(.03)	(2.33)				(.04)	(3.42)		
Other CE	.83**	−.47	75	.65	Other CE	.63**	6.81	142	.47
	(.04)	(3.15)				(.06)	(5.43)		
Non-CE	.88**	2.81*	61	.64	Non-CE	.73**	−.38	113	.53
	(.01)	(1.31)				(.01)	(1.30)		
Cohort 2-3					Cohort 2-3				
Title I	.75**	.075	109	.52	Title I	.59**	7.90**	172	.38
	(.03)	(2.26)				(.04)	(3.72)		
Other CE	.80**	4.07	95	.69	Other CE	.82**	6.23	77	.56
	(.03)	(2.72)				(.06)	(5.39)		
Non-CE	.89**	−1.94	61	.71	Non-CE	.76**	−1.86	109	.59
	(.01)	(1.37)				(.01)	(1.29)		
Cohort 3-4					Cohort 3-4				
Title I	.70**	−3.37	134	.46	Title I	.74**	2.83	112	.48
	(.03)	(2.32)				(.04)	(3.40)		
Other CE	.97**	3.11	19	.61	Other CE	.84**	13.69**	65	.63
	(.04)	(3.77)				(.05)	(6.07)		
Non-CE	.96**	.89	32	.71	Non-CE	.85**	−2.35	76	.61
	(.01)	(1.57)				(.01)	(1.61)		
Cohort 4-5					Cohort 4-5				
Title I	.72**	−8.78**	136	.49	Title I	.72**	1.62	134	.54
	(.03)	(3.12)				(.03)	(3.50)		
Other CE	.81**	−.73	97	.69	Other CE	.78**	5.28	110	.61
	(.03)	(3.97)				(.05)	(6.59)		
Non-CE	.95**	2.96*	36	.79	Non-CE	.82**	1.67	94	.67
	(.01)	(1.41)				(.01)	(1.65)		
Cohort 5-6					Cohort 5-6				
Title I	.85**	−2.61	83	.63	Title I	.72**	3.26	149	.45
	(.03)	(2.94)				(.04)	(4.64)		
Other CE	.91**	5.01	45	.77	Other CE	.84**	25.10*	80	.71
	(.04)	(4.79)				(.06)	(9.57)		
Non-CE	.97**	4.39**	26	.82	Non-CE	.83**	−.97	101	.69
	(.01)	(1.42)				(.01)	(1.80)		

Standard errors of the coefficients in parentheses. * P < .05 ** P < .01 *** Semi-longitudinal, including students missing certain socioeconomic variables.

APPENDIX E

SUPPORTING TABLES FOR CHAPTER 5

Table E-1

Regression Analysis Results for Reading and Math for Cost of Instructional Resources Used by Student Achievement for Five Cohorts of Summer School Attendees

	Reading					Math			
Selection Category	Pretest	Program Cost	Constant	R^2	Section Cohort	Pretest	Program Cost	Constant	R^2
Cohort 1-2 (Total)	.91** (.03)	.06 (.06)	43	.63	Cohort 1-2 (Total)	.74** (.03)	.22 (.13)	99	.51
Title I	.76** (.05)	.11 (.08)	96	.53	Title I	.68** (.05)	.07 (.27)	117	.56
Other CE	.84** (.06)	.15 (.13)	65	.59	Other CE	.62** (.08)	.39 (.29)	146	.37
Non-CE	1.03** (.05)	.13 (.11)	1	.67	Non-CE	.78** (.04)	–.05 (.19)	93	.53
Cohort 2-3 (Total)	.82** (.03)	.03 (.06)	88	.63	Cohort 2-3 (Total)	.79** (.03)	.33* (.13)	93	.57
Title I	.71** (.04)	.08 (.08)	122	.57	Title I	.67** (.07)	.23 (.22)	144	.48
Other CE	.74** (.05)	–.09 (.12)	128	.60	Other CE	.90** (.07)	.12 (.33)	50	.59
Non-CE	.90** (.05)	.15 (.11)	53	.62	Non-CE	.80** (.04)	.45* (.18)	81	.57
Cohort 3-4 Total)	.91** (.03)	.05 (.07)	41	.67	Cohort 3-4 (Total)	.90** (.03)	.11 (.14)	47	.63
Title I	.78** (.05)	.09 (.11)	92	.54	Title I	.71** (.06)	–.59* (.27)	139	.54
Other CE	.85** (.07)	–.04 (.14)	75	.60	Other CE	1.03** (.08)	–.25 (.31)	–6	.61
Non-CE	.89** (.05)	.12 (.11)	62	.61	Non-CE	.92** (.05)	.50* (.20)	30	.69

Table E-1 (Continued)

Cohort 4-5 (Total)	.84**	.03	80	.68	Cohort 4-5 (Total)	.84**	.07	82	.67
	(.03)	(.10)				(.03)	(.12)		
Title I	.76**	.19	107	.55	Title I	.86**	.15	65	.62
	(.06)	(.16)				(.06)	(.18)		
Other CE	.62**	.15	179	.47	Other CE	.73**	.13	135	.67
	(.08)	(.36)				(.07)	(.23)		
Non-CE	.84**	–.07	92	.70	Non-CE	.83**	–.02	87	.64
	(.04)	(.12)				(.05)	(.25)		
Cohort 5-6 (Total)	.92**	.03	49	.76	Cohort 5-6 (Total)	.83**	.01	101	.61
	(.03)	(.09)				(.04)	(.20)		
Title I	.79**	–.05	113	.48	Title I	.74**	–.41	149	.39
	(.07)	(.17)				(.09)	(.35)		
Other CE	.91**	.09	45	.80	Other CE	.99**	.48	6	.63
	(.07)	(.34)				(.11)	(.70)		
Non-CE	.94**	.07	42	.83	Non-CE	.74**	.04	154	.60
	(.04)	(.09)				(.05)	(.24)		

Standard errors in parentheses

* P < .05

** P < .01

Table E-2

Regression Coefficients for Reading and Math Pretest Scores by Cost of Instructional Resources Used by Three Levels of Achievement Status for Five Cohorts

	Reading					Math			
Selection Category	Pretest	Program Cost	Constant	R^2	Selection Category	Pretest	Program Cost	Constant	R^2
Cohort 1-2					Cohort 1-2				
Lowest Quarter	.43**	.09	211	.14	Lowest Quarter	.47**	.32	191	.11
	(.07)	(.08)				(.11)	(.20)		
Second Quarter	.95**	.16	24	.08	Second Quarter	.86**	.03	53	.06
	(.27)	(.10)				(.27)	(.24)		
Above the Median	.90**	−.07	58	.32	Above the Median	.83**	.35	59	.33
	(.10)	(.12)				(.09)	(.23)		
Cohort 2-3					Cohort 2-3				
Lowest Quarter	.60**	.05	171	.32	Lowest Quarter	.55**	.28	185	.18
	(.05)	(.08)				(.09)	(.19)		
Second Quarter	.90**	.01	57	.11	Second Quarter	.99**	.22	2	.07
	(.20)	(.10)				(.31)	(.22)		
Above the Median	.74**	.11	126	.21	Above the Median	.85**	.54*	60	.34
	(.12)	(.16)				(.10)	(.26)		
Cohort 3-4					Cohort 3-4				
Lowest Quarter	.52**	.27*	198	.21	Lowest Quarter	.77**	.17	102	.42
	(.07)	(.11)				(.07)	(.19)		
Second Quarter	.84**	.08	74	.10	Secord Quarter	.70**	.11	140	.08
	(.22)	(.10)				(.24)	(.22)		
Above the Median	.81**	−.23	112	.32	Above the Median	.99**	.10	3	.18
	(.11)	(.15)				(.18)	(.33)		

Table E-2 (Continued)

Cohort 4-5					Cohort 4-5				
Lowest Quarter	.52**	.09	219	.24	Lowest Quarter	.63**	.29	170	.29
	(.06)	(.12)				(.08)	(.18)		
Second Quarter	.95**	.05	25	.10	Second Quarter	.88**	–.24	69	.11
	(.26)	(.15)				(.23)	(.20)		
Above the Median	.73**	–.04	153	.29	Above the Median	.96**	.03	14	.41
	(.12)	(.34)				(.11)	(.27)		
Cohort 5-6					Cohort 5-6				
Lowest Quarter	.71**	.06	148	.34	Lowest Quarter	.78**	–.17	125	.27
	(.08)	(.14)				(.12)	(.33)		
Second Quarter	1.04**	.22	–25	.17	Second Quarter	.22**	.21	442	.01
	(.25)	(.13)				(.29)	(.32)		
Above the Median	.87**	.07	83	.52	Above the Median	.79**	.22	122	.34
	(.10)	(.23)				(.12)	(.39)		

Standard errors in parentheses.

* $P < .05$

** $P < .01$